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What's the Big Idea?

The role of social interaction as a motivator in online classes

Snyder, Ronald

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What's the Big Idea?
The role of social interaction as a motivator in online classes

Ronald E. Snyder

A thesis submitted for the degree of Doctor of Education

University of Bath

Department of Education

July 2018

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A handwritten signature in black ink, appearing to read 'RESN', followed by a horizontal line.

Abstract

Online education has the potential for radically altering the field of education within our lifetime. Unfortunately, too many programs are being developed as a cost saving measure with little regard to the pedagogical needs of this emergent field. If this field is to develop in such a way that it meets the needs of the future generations, it must be grounded in theories of learning and motivation.

This paper describes a research study of behavioral intentions to use a virtual learning environment for international high school students. Unlike many other earlier technology acceptance studies, it is grounded in a rich motivational theory of learning: Self-determination theory. The study also includes a new conceptual diagram, the Motivation Enhanced Technology Acceptance (META) Model to study of the phenomenon of technology acceptance from a motivational perspective. This is a Design-based research study and, as such, has both practical and theoretical goals. It seeks to refine theories of technology acceptance and use by grounding them in Self-determination theory. It also seeks to provide a usable design solution to guide practitioners in designing online courses

Table of Contents

Abstract.....	2
Table of Contents.....	3
List of Figures	7
Acknowledgements.....	8
Chapter One: Problem Statement.....	9
I. Introduction.....	9
II. Theoretical and practical approaches	15
A. Theoretical Lens (Technology Acceptance grounded in Self-determination theory)	15
B. Draft principles guiding the intervention	17
III. Assumptions.....	18
A. Personal assumptions	18
B. Pedagogical Assumptions	19
IV. Limitations	20
V. Unique contributions of the study	21
Chapter 2: Literature Review	24
I. Introduction.....	24
II. Technology acceptance	25
A. Technology Acceptance Model	26
B. Unified theory of acceptance and use of technology (UTAUT)	27
C. Motivational approaches to technology	29
III. Theories of Motivation.....	31
A. Needs.....	32
B. Quality of Extrinsic Motivation	34
C. Internalization	38
D. Motivation and the three psychological needs	40
1. Autonomy	40
2. Competence.....	42
3. Relatedness	44
IV. The Question of context.....	54
V. Key Definitions	58
VI. Summary	61
Chapter 3: Methodology	63
I. Introduction and aim of the study	63
II. Design of the study	64

A.	Introduction: Design-based research.....	64
B.	Characteristics of Design-based research.....	65
A.	The Design-based Research Process.....	68
1.	First Phase: Needs Analysis.....	69
2.	Second Phase: Design Solution.....	72
3.	Third Phase: Iterative Testing	73
4.	Fourth Phase: Broad Evaluation	77
III.	Data Analysis	85
A.	First Iteration: Pilot Research Enquiry.....	85
B.	Second Iteration	86
C.	Third Iteration	88
D.	Phase 4 (Broad Evaluation).....	88
IV.	Trustworthiness of the study	93
A.	Validity	93
B.	Potential Research Bias.....	95
V.	Limitations	96
	Chapter Four: Results and Discussion	97
I.	Introduction.....	97
II.	First Iteration: Pilot Research Enquiry.....	97
A.	Pilot Research Enquiry Quantitative Findings	97
B.	Pilot Research Enquiry Qualitative Findings.....	98
III.	Pilot Study Evaluation	99
IV.	Main Study (Second and Third Iterations).....	100
A.	Second Iteration	100
B.	Third Iteration	101
V.	Summative Evaluation	103
A.	Selecting Participants/ Descriptive Statistics	103
B.	Horizontalization and Reduction	106
C.	Identified Themes	108
D.	Autonomy, Competence and Relatedness Online.....	109
1.	Autonomy	112
2.	Competence.....	115
3.	Relatedness	117
E.	The Many Impacts of Interaction.....	132
1.	Interaction and Autonomy	133

2. Interaction and Competence.....	134
3. Interaction and Relatedness	136
4. Interaction can increase internalization.....	139
5. Lack of Interaction can lead to Feelings of Isolation	142
F. Motivation is a Continuum	144
1. Controlled Regulation	145
2. Autonomous Regulation	145
3. The Big Idea and Internalization.....	146
Chapter Five: Summary and Conclusion	149
I. Introduction.....	149
A. Summary of the literature	151
B. Rationale for and complexities of Design-based research	153
C. Design of the study	154
D. Reflections on the process.....	158
II. Research Questions and the META Model.....	160
A. Research Questions	162
What are the effects of student-student interaction on motivation to engage in virtual learning?..	162
What are the effects of student-teacher interaction on motivation to engage in virtual learning?..	163
How do perceptions of Autonomy, Competence and Relatedness impact motivation to engage in virtual learning?	164
E. The META model explained.....	167
III. Summary of themes	172
A. Autonomy, Competence and Relatedness in an Online Context	172
1. Autonomy	172
2. Competence.....	173
3. Relatedness	174
B. The many impacts of Interaction	176
C. The Motivation Continuum.....	177
IV. Unique contributions of the study and areas for further research	179
A. Relatedness and behavioral intention.....	179
B. The Motivation Enhanced Technology Acceptance (META) Model.....	180
C. The role of novelty	181
D. Implications for Practice: Design Principles.....	182
V. Conclusion	188
Bibliography	191
Appendix A: EDC 603: Instructional Design and Technology Units	207

Appendix B: Questions based on a modified Sense of Community Index	208
Appendix C: Sample questions about the participants' personal reflections	209
Appendix D: Clusters of Meaning and Associated Significant Statements	210
Appendix E: Draft Design Principles following the Pilot Research Enquiry	213
Appendix F: Initial Codes	215
Appendix G: Participant statements grouped into themes	219
G1. Autonomy, Relatedness and Competence Online	219
G2. Autonomy.....	222
G3. Competence.....	225
G4. Relatedness.....	227
G5. Relatedness in the Big Idea Project.....	229
G6. Membership	230
G7. Membership: Knowing each other, Positive and negative indicators	231
G8. Influence.....	232
G9. Influence Continued.....	234
G10. Influence: Reflexivity	236
G11. Influence: Technical problems	238
G12. Influence: Teachers	239
G13. Integration and fulfillment of needs	240
G14. Integration and fulfillment of needs: Teachers	242
G15. Emotional Connection.....	244
G16. Emotional Connection: Common experiences.....	246
G17. Designing for emotional connection	247
G18. Emotional connection: Teachers	250
G19. Challenges to emotional Connection	254
G20. The many impacts of interaction.....	256
G21. Interaction and Autonomy.....	258
G22. Interaction and Competence.....	259
G23. Interaction and Relatedness.....	262
G24. Interaction can increase internalization.....	266
G25. Lack of interaction and lead to feelings of isolation	270
G26. Motivation is a continuum	272
G27. Controlled regulation	274
G28. Autonomous regulation.....	276
G29. The Big Idea and internalization	278

List of Figures

Figure 1: Structure of the Big Idea project.....	15
Figure 2: Motivation Enhanced Technology Acceptance Model.....	16
Figure 3: Theories applied in e-learning acceptance studies (Šumak et al., 2011, p. 2070)	25
Figure 4: Original Technology Acceptance Model (Davis, 1989)	26
Figure 5: TAM2 (Davis & Vanketesh, 2000)	26
Figure 6: The UTAUT Model (Vanketesh, 2003, p. 447)	27
Figure 7: Lee, Cheung and Chen's Research Model.....	30
Figure 8: NEEDS of Self-determination theory	33
Figure 9: Motivation continuum (Adapted from Deci & Ryan, 2000a; Visser, 2017).....	35
Figure 10: Reeves model of design-based research	68
Figure 11: Bannan-Ritland's Integrative Learning Design (2003, p. 22)	69
Figure 12: Design of the study	70
Figure 13: Social UTAUT (Snyder, 2014)	75
Figure 14: Summary of demographic information.....	78
Figure 15: VLE usage data.....	102
Figure 16: Summary of demographic data	104
Figure 17: Narrative description of demographic information	106
Figure 18: Reduced codes.....	107
Figure 19: Themes and Subthemes	109
Figure 20: Theme 1 Autonomy, Competence and Relatedness online.....	109
Figure 21: Theme 2 The many impacts of interaction	132
Figure 22: Theme 3 Motivation is a continuum	144
Figure 23: Unified Theory of Acceptance and Use of Technology.....	151
Figure 24: Design of the study	155
Figure 25: UTAUT with the inclusion of ATT, PI and TI as constructs (Snyder, 2014).....	156
Figure 26: SDT in a web-enhanced course template.....	168
Figure 27: META Model.....	169
Figure 28: Design principles and sample class activities.....	188

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Chapter One: Problem Statement

I. Introduction

Addressing the problem of high dropout rates in online programs is a major challenge of virtual learning programs, causing large numbers of students to fail to meet their academic goals. (US Department of Education, 2004). Numerous studies have highlighted issues of retention, satisfaction and engagement in online courses as far more problematic than in their face-to-face equivalents (e.g. Rovai, 2002; Berge & Clark, 2005; Roblyer, 2006; Lin, Lin & Laffey, 2008; Reid, Aqai & Putney, 2009; Bekele, 2010; Lee, 2010; Thomas, Herbert & Teras, 2014). Carr (2000) found that overall retention rates were 10-20% lower than those in face to face classes while drop-out rates in rural schools were up to 40% higher than in equivalent face-to-face classes (Hadre & Reeve, 2003). In 2016, Bawa discovered no substantial change to this situation: drop-out rates were still 10-20% higher than in face to face classes with 40-80% of online students failing to complete their courses. This is an ongoing problem in online education and it is unlikely to change without a reexamination of the current policies, procedures and practices that support instructional design paradigms grounded in the face-to-face era.

Having said that, online learning has found success amongst many different types of learners and in many different disciplines, in a context that is inherently different than the face-to-face environment (US Department of Education, 2010a; Artino & Jones, 2012). This success has allowed students numerous benefits in time and flexibility without sacrificing academic rigor (Tsai et al., 2008) and has allowed schools to increase access in both quantity and quality of courses and highly qualified teachers (Barker & Wendel, 2001; Barbour & Mulcahy, 2009; Fischer, 2009). Online learning programs are also more scalable than face-to-face programs, allowing schools to make limited resources go further (Zucker & Kozma,

2003). It frees students from the limitations of time, distance and accessibility (Bates, 2005 in Harnett, St. George & Dron, 2011; Chen, 2007; van Raaij & Scheppers, 2008; Herbert & Teras, 2014), and is applicable to students across cultures (Zembylas & Vrasidas, 2005). While, online learning holds great potential for addressing the needs of diverse students in the digital era, virtual learning environments must first be accepted and used by students and must be designed in such a way that they capture the hearts and minds of today's youth (Martins & Kellermans, 2004; Lee, 2010; US Department of Education, 2010a; van Raaij & Scheppers 2008; Brahmasrene & Lee, 2012).

The online learning sector is one of the most rapidly growing sectors in global education (Punnoose, 2012). It is disrupting current school practices from scheduling through assessing and has been described as “nothing less than the single most important reorganization of how we will engage learners since we started to gather students together in school buildings (Huett, Fushay & Coleman, 2008, p. 68).” It has the potential to provoke radical change in all sectors of education, providing 21st century students with the skills necessary to thrive in an ever-changing role in an evolving workforce (Fischer, 2009). However, with this potential for radical change, comes a high degree of uncertainty, where rapid solutions to resolve uncertainty may lead to less than adequate innovations (Parsons & Fidler, 2005). Therefore, it becomes important to ground this educational change in both theory and practice, guarding against implementation of reactive and/or under thought policies and procedures (Watson, 2005). If an online learning solution is developed that is grounded in practically and theoretically sound policies, then this relatively new innovation has the potential to be recognized and embraced at the institutional, national and international levels, and to redefine and strengthen the school's primary task (Tushman, Newman & Romanelli, 1986; Loch & Huberman, 1999; Wollin, 1999; James & Connolly, 2007).

The first step is for instructional designers, teachers, educational leaders, researchers and policy makers to begin to identify the critical components of online programs, not only in terms of achievement, but also in terms of acceptance and continuance (Reid, Aqui & Putney, 2009). Or, in other words, “the undeniable fact is that some students succeed in the virtual educational environment and some fail just as they do in traditional classroom environments. The key lies in understanding the critical components in an educational context that promote and encourage student success. A good starting point for this understanding is the field of technology acceptance and use (Rice 2006, pp. 432-433).”

Several models have been put forward to investigate the acceptance and use of technology. One stream of research has focused on extrinsic and intrinsic motivation (e.g. Vanketesh, 2003; Yee, 2006; Sanchez & Hueros, 2010; Przyblynski, Rigby & Ryan, 2010), often aiming at identifying predictors of success (Robyler & Marshall, 2003; Cavanaugh, et al., 2004; Kachel, et al., 2005). A second stream is based around the Technology Acceptance Model and its derivatives (Fagan, Neil & Woolridge, 2008). Technology acceptance research typically attempts to isolate constituent factors influencing a user’s intent to use the new technology as well as his or her desire to continue with it in the near future. In other words, technology acceptance models attempt to isolate the perceptions that energize the action of adaption and continued use of the technology. This is therefore, an attempt to understand and identify the *underlying* motivations for acceptance and use. However, technology acceptance models have generally failed to include motivation research in the models (Reber, 2005; Artino 2008; Roca & Gagne, 2008; Harnett, St George & Dron, 2011). In fact, in terms of studies involving technology acceptance and use within online learning, Bekele (2010) was only able to identify 11 studies that included motivational components. An extremely small number of models have attempted to merge the two streams of research. A 2015 search in

EBSCO Host found just two studies combining motivation and the technology acceptance model with online learning and neither of them dealt with K-12 pupils.

Statement of the Problem

Developing instructional supports to encourage the acceptance and continued use of technology is an ongoing challenge in K12 online courses and programs given that:

1. The online context is quite different from the face-to-face context;
2. Technology use in what is inherently a social experience is much different than utilitarian, individual program uses such as using a new program at work, or banking through a new ATM system.
3. It is much easier to develop relational supports in a face-to-face context where issues of nonverbal communication such as body language or voice inflection do not exist.

Broadly speaking, this study investigated motivating influences on behavioral intention to accept and persist in online learning. Specifically, it sought to identify the impact of online, primarily asynchronous student to student interactions as a Relatedness support to increase behavioral intention toward acceptance and continued use of the virtual leaning environment.

Purpose and Research Questions

In order to explore this impact of interaction on behavioral intention, this study integrated theories of technology acceptance and motivation within a working virtual high school in order to explain the phenomena behind students' choices to engage in online learning and their continued participation therein.

In Design-based research (DBR) studies, the research questions emerge from the stated problem. For this study, the research question(s) must address issues of behavioral intention to accept and persist in online courses. Furthermore, as DBR studies typically involve a close collaboration between the researcher and the research participants, participants are often

involved in defining the problems and developing the research questions. In this study, as in many other DBR studies, the problem definition and the development of the research questions were amended in the early stages of the research (Herrington, et al., 2007). The initial goal of investigating the impact of student-student interaction was broadened at this point to include teacher-student interactions. Finally, to avoid the same pitfalls of previous studies vis-à-vis neglecting the study of basic motivational needs that became evident in the literature, the impact of Autonomy, Competence and Relatedness on motivation and behavioral intention were also discussed in the interviews. Therefore, the initial research question remained:

1. What are the effects of student-student interaction on motivation to engage in virtual learning?

However, during the course of the study the following additional questions emerged as important:

2. What are the effects of teacher-student interaction on motivation to engage in virtual learning?
3. How do perceptions of Autonomy, Relatedness and Competence impact motivation to engage in virtual learning?

This Design-based research study sought to: (a) determine if there is a connection between interactions within the virtual learning environment and behavioral intent, either directly or as a distal support through Relatedness; (b) determine if the current Relatedness supports within the QSI Virtual School (QVS) design principles were a viable means to support student-student interaction; and (c) identify the extent to which perceptions of Relatedness, Autonomy and Competence impacted behavioral intent.

QSI Virtual School is a supplementary online high school whose mission is to assist students in Quality Schools International (QSI) to meet the academic requirements of

students, particularly for students at smaller QSI schools where they are unable to offer appropriate level courses but also for students at larger schools whose schedule does not permit them to take specific classes locally. As such, in SY2012-13, QVS students came from QSI schools with as few as seven other students and were in QSI Virtual School classes with as few as four other students. To support the social needs of these students, it was decided in an initial needs analysis to require a socially interactive component in each unit. However, this failed to achieve the desired support of Relatedness due to the fact that several QVS courses had less than 10 students. In July 2013, QVS teachers met in Malta and discussed ways in which Relatedness supports could be embedded into the virtual program. At the end of the two-week session, they developed the concept of the initial “Big Idea project” based upon the draft principles uncovered in previous iterations of the QVS program. The Big Idea project (<https://www.youtube.com/watch?v=NkqUsDvezVI>) was originally designed to convene four times each academic year in order to increase social interaction amongst students and to attempt to draw together each of the disciplines into a connected understanding of a given topic.

One Big Idea project asked the question, “What makes something revolutionary?”. For the next three weeks, students debated and investigated this question. During stage one, all students met together in a single discussion forum to debate the question as a whole group. They watched a video produced by QVS teachers that could be used to In stage 2, students “returned” to their individual courses and tackled the question from the perspective of an

economist, biologist, literary critic, etc. Finally, in stage three, students came back together in a new forum-based activity to discuss their findings and to continue the debates of stage 1.

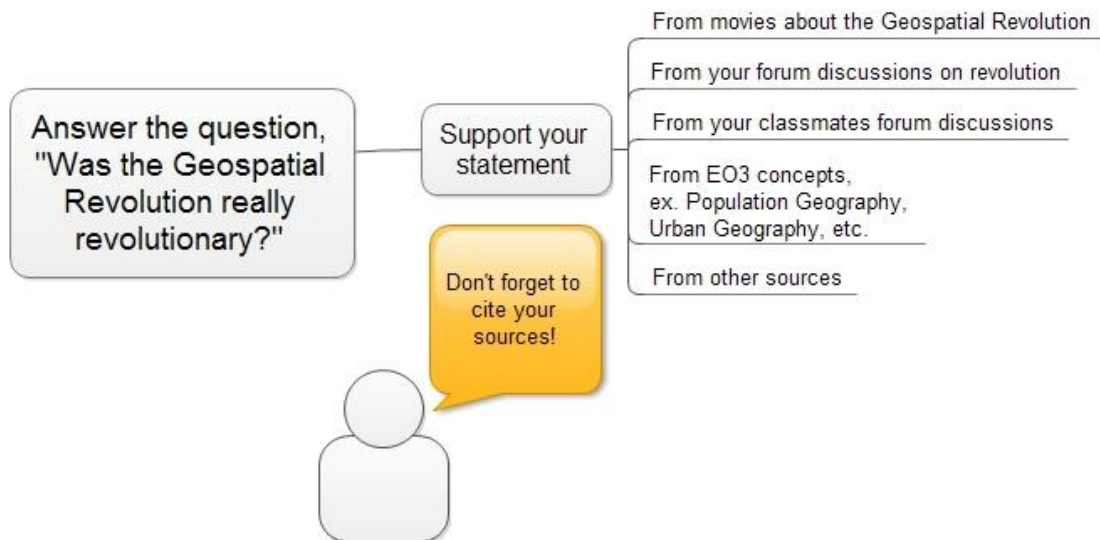


Figure 1: Structure of the Big Idea project

In summary, the original intent of this study was to uncover ways in which student-student interactions support students' behavioral intention to use and persist in their online studies. A secondary goal became to investigate how student-teacher interactions impact behavioral intent and also to study the impact of supports for Relatedness, Competence and Autonomy on behavioral intent. The final phase of data collection included in depth interviews of seven QVS students to investigate these concerns within the disciplinary courses and to compare the effectiveness of the Big Idea project as a way of supporting interactions as a Relatedness support in an online context.

II. Theoretical and practical approaches

A. *Theoretical Lens (Technology Acceptance grounded in Self-determination theory)*

This study investigates constructs of technology acceptance models, grounded within Self-determination theory (SDT), a meta-theory of human well-being and motivation. The following Motivation Enhanced Technology Acceptance (META) model begins with the three basic psychological needs of SDT as a support for autonomous academic motivation and conceptualizes them as direct influences on autonomous motivation and distal supports of

behavioral intention to use the technology. The model and the basic tenants of SDT were explained to student participants during the interviews. This follows the model of the student as an active research participant in the study (see Methods). Moreover, it uses traditional constructs from different technology acceptance models as supports for the three basic psychological needs of SDT.

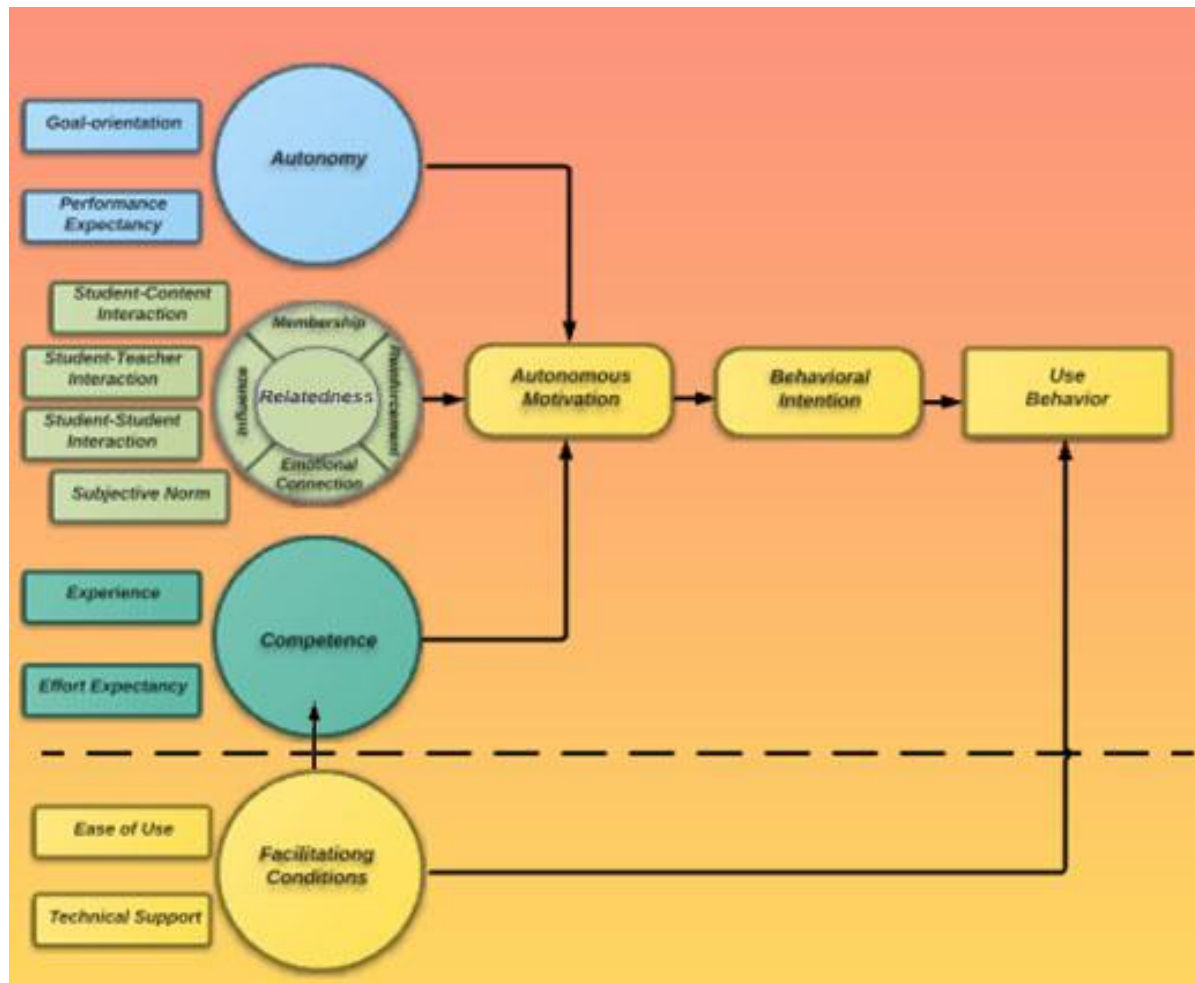


Figure 2: Motivation Enhanced Technology Acceptance Model

As in other technology acceptance models, the META model is based on the premise that greater behavioral intention will lead to greater actual use behavior. Performance expectancy and goal-orientation are seen as supports for Autonomy as they align with the self-organization of behavior characteristic of Autonomy. Many technology acceptance models

include experience as a moderating influence and so, both experience and effort expectancy are both seen as a moderator of Competence. As experience increases and effort expectancy decreases, students should experience a higher perception of Competence when using the system. Modifiers of Relatedness include the subjective norm, which is typical of technology acceptance models. Sense of community research was used to investigate concepts of Relatedness more deeply and three types of interaction (student-student, student-teacher and student-content) were seen as supports for it. Facilitating conditions was still included as a direct influence on behavioral influence as this has been borne out in other research (e.g. Vanketesh, 2003) as well as earlier iterations of this study where technological difficulties undermined behavioral intention (Snyder 2010; 2014). Effort expectancy is seen as a modifier of facilitating conditions as well as the presence of effective technical support. The model predicts that when supports for Autonomy, Competence and Relatedness are built into the instructional design, student behavior will become more autonomously regulated, leading to an increase in behavioral intention to use and persist in online education, which will lead to an increase in actual use behavior.

B. Draft principles guiding the intervention

Drawing on the literature review and earlier iterations of studying QSI's virtual learning environment, the following draft principles were initially employed in QVS courses (Snyder, 2012, pp. 16-17). These draft principles were evaluated against the results of this study and modified for future recommendations to the current director of QVS as well as the QSI Virtual Learning Coordinator and the QSI Director of Operations for use within all online and/or blended learning approaches.

- Social Conditions
 - Units will always include a social element
 - Collaboration will be encouraged
 - Communication with teachers will be timely and substantive
 - All academic interaction will take place within the virtual learning environment
- Structure of the units
 - Classes will follow a predominantly cognitivist learning approach in line with QSI philosophy although other learning approaches may be included as supplementary
 - Unit format will be standardized across QVS
 - Expectations and assessment criteria will be explicit and easy to follow
 - Successes will be recognized and encouraged

III. Assumptions

A. *Personal assumptions*

The following personal assumptions are included in order to address issues of trustworthiness in the study which could bias the study. First, I assume that Relatedness is a basic psychological need, and, as such, is necessary both as a means to motivate individuals and to ensure psychological well-being. I do not feel that Relatedness is less important or differently important than Autonomy or Competence to well-being. I believe that each student has a different level of need for Relatedness based on how it is met locally but that it is important to include Relatedness supports in instructional designs even if this need is met locally. Therefore, I assume that all students would see an increase in behavioral intention to use the system based on an increase in perceived Relatedness through greater interactivity within the courses. Finally, I assume that the level of perceived Relatedness may increase due to the Hawthorne effect, i.e. there may be an increase in perceptions based on calling attention to the phenomena during interviews about Relatedness and, more broadly, motivation, levels of behavioral intention, levels of autonomous motivation and other concepts we discussed.

B. Pedagogical Assumptions

QVS operates under the policies and theoretical foundations of Quality Schools International. This necessarily influences the instructional design of QVS courses. QSI has adapted the motto, “Success for All”, based on Gray and Hymel (1992). Building from that basic model, QSI as an institution believes that:

- Virtually all students can learn successfully;
- Success breeds success;
- It is up to the schools to create the conditions of success

QSI operates under an outcomes-based educational model where teachers are responsible for developing instructional plans that scaffold learning objectives to ensure success, regardless of the starting point. In theory, students are grouped so that it is easier to apply correctives or enrichment activities where needed. QSI’s philosophy supports both extrinsic and intrinsic motivational supports. Enrichment opportunities are designed to allow students to undertake intrinsically interesting avenues of study after they demonstrate basic mastery of the targeted learning objectives. Teachers determine when mastery has been reached and build in correctives when students are having difficulties. (Gray & Hymel, 1992). Therefore, motivation within the QSI schools is centered around praise from the teacher, “reinforcement and reward are the motivational incentives teachers can offer students. A teacher’s praise and encouragement, for example, can often have a very strong influence on students’ motivation for learning (Gusky, 1985, p. 99).” The ability to obtain high marks in their studies is also given as a specific motivator. However, the potential for more autonomous forms of motivation also exist, including allowing for exploration of areas of intrinsic interest. Since the learning

outcomes are explicit and transparent and feedback is designed to be quick and substantial, students are able to take control of their own education.

QSI schools are designed to measure mastery of learning objectives within the academic year, regardless of the time it takes to achieve them. Students are rewarded with grades of Mastery or Beyond Mastery when they successfully complete the learning objective. If a student does not demonstrate mastery, the grade is listed as “In Progress” and remains so without penalty until the student is able to master the targeted learning objective. This expanded opportunity may encourage higher perceptions of Competence and Autonomy but could be a threat to Relatedness if schools employ a totally independent approach for students who fail to achieve mastery within the unit window.

Still, QSI does recognize the value of student-student interaction. While students are placed according to ability in Reading, Writing and Mathematics, in all other subjects, students are placed with their peer group. Therefore, while an advanced middle school student may be placed in a high school Mathematics or English course, s/he would still be in all other courses with his/her peer group. This is slightly different in QVS courses as none of them are bound to a particular peer group. Thus, implementing Relatedness supports for QVS courses becomes a greater challenge and a greater need.

IV. Limitations

The main limitation of this study is the limited external validity as all students were enrolled in a QSI school and were taking classes through QVS. Fullan (1999, p. 21) believed that “it is a theoretically and empirically impossibility to generate a theory that applies to all situations.” Therefore, caution should be taken in over applying these findings to other contexts. Furthermore, since so many studies have empirically tested technology acceptance

models with varying degree of correlation between the constructs, this study does not seek to retest extant models but to identify possible new constructs and relationships that have emerged through interviews and surveys with student participants, particularly within the social domain. Additionally, students also have limited choice in whether or not they have to take QVS courses. Voluntariness has been previously identified as a modifier to technology acceptance constructs (Vanketesh, 2003) and may negatively impact interest and effort in the courses. A practical limitation is time. Several participants opted out of the interview process, which meant that I had to crop my study to fit the smaller volunteer pool. Had there been unlimited time, I could have sought out additional participants to interview. Participants were chosen to represent a mix of small, medium and large schools in QSI. A mix of male and female were also sought out as well as a spread of geographic locations across QSI. While this provided a broad overview of a range of students within QSI, it also meant that a very limited number of participants were studied in the summative evaluation phase of the study. Finally, as the former director of QVS, my interest in the success of the online program could potentially lead to biased judgment on the final design. In order to avoid this, previous studies of the QVS virtual learning environment were used to triangulate the final results and thereby increase overall reliability.

V. Unique contributions of the study

The broad objective of this research is to investigate the acceptance of virtual learning environments by students, i.e. how online classes can be designed to support students' motivational needs and thereby increase engagement and reduce dropout rates. Within this objective, this study specifically aims to identify the impact of various types of interactions upon both Relatedness and behavioral intention and to define the role that Relatedness plays in technology acceptance in relation to Autonomy and Competence. Furthermore, by

including psychological sense of community studies as a way of identifying basal components of Relatedness, it adds articulated motivational constructs to both Self-determination theory and current technology acceptance models. Therefore, this study adds to both technology acceptance research through its inclusion of Self-determination theory and to SDT itself by using psychological sense of community to articulate the basal components of Relatedness.

In addition to the theory-based goals above, this study also seeks to achieve practical goals by developing design principles to guide teachers and administrators in the QSI Virtual School. It is because of the dual theoretical and practical goals of the study that a Design-based research method was chosen. Design-based research is commonly used in computer-based research and the learning environments they employ to add new knowledge within the field but also to create artifacts used to solve identified problems (Mantai, 2008). Furthermore, these dual goals align well with the University of Bath's Doctor of Education program as they feature of an, "interplay and relationship between professional practice and scholarship (University of Bath, 2016)."

The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) have been empirically studied in a variety of settings. However, low and/or inconsistent levels of predictability may indicate the presence of inappropriate constructs or the lack of more appropriate ones. Therefore, the final phase of this study applied a qualitative approach to the phenomenon of technology acceptance, seeking to derive new constructs for technology acceptance models and thereby improve predictability. From this, a new model of technology acceptance was proposed. The Motivation Enhanced Technology Acceptance (META) model is grounded in Self-determination theory but still incorporates the constructs of technology acceptance.

Finally, “motivation can be a complex and multifaceted phenomenon that cannot be fully explained from the perspective of motivation as either an effect of learner characteristics or an effect of learning environment design (Harnett, St. George & Dron, 2011, p. 33).” Any explanation should include an interplay between the learner and the learning environment. Self-determination theory offers an excellent example of just such a type of situated motivation but has generally been overlooked in technology acceptance and online learning research (Chen, 2007). Furthermore, the impact of Relatedness on autonomously regulated extrinsic motivation is limited in SDT literature and nearly non-existent in online and technology acceptance studies. While this study is grounded in SDT, it draws on technology acceptance research and psychological sense of community in order to further articulate the impact of Relatedness on autonomous motivation, an approach that has not been attempted as of yet.

Chapter 2: Literature Review

I. Introduction

Online programs hold great potential for students in terms of flexibility, achieving goals that cannot be met locally and increasing contact to high quality content. Furthermore, numerous studies have indicated that the quality of online classes is at least equivalent to that of face-to-face classes (e.g. Rice, 2006; Barbour & Mulcahy, 2009; Fischer, 2009; US DOE, 2010a; US DOE, 2010b). However, online learning has not been able to fulfill its potential due to attrition rates that are considerably higher than those in face-to-face classes (Tsai et al, 2008). One of the primary reasons for this is that online programs often fail to meet students' social needs, fostering feelings of isolation (Rovai, Wighting & Lucking, 2004). Virtual learning systems have often been charged with being cold and impersonal and many studies have noted perceptions of isolation as a downside to the medium (e.g. Hargreaves, Earl & Ryan, 1996; Rice, 2006; Chen, 2007; Fischer, 2009; Greenway & Vanourek, 2006; Kim & Frick, 2011; Butz et al., 2014). Moreover, this perception of isolation in online programs exists across culturally and linguistically diverse populations and suggests that an explicit focus on the socio-emotional and community building in online pedagogy needs to be considered (Huett, Foshay & Coleman, 2008; Delahunty, Verenikina & Jones, 2014; Thomas, Herbert & Teras, 2014). Overcoming this perceived sense of isolation remains a challenge to online pedagogy (Barbour & Plough, 2009) and there is some indication that addressing a student's socio-emotional needs by developing a strong sense of community in the online classroom may be an effective way of combating isolation and lowering dropout rates (Rovai, 2001; Rovai, 2002; Delahunty, Verenikina & Jones, 2014).

Through this study I hope to assist teachers, instructional designers and school leaders in determining factors influencing successful acceptance and continued use of virtual learning

environments in international schools, specifically how online interactions and supports for Autonomy, Competence and Relatedness impact behavioral intention. This literature review employs a thematic approach, focusing both on technology acceptance models and theories of motivation. The broader themes are then narrowed down to focus on the online context. Since research on the K-12 context is extremely limited, studies in higher education have been included as well. While, this may raise questions of relevance to the K-12 context, including them was felt necessary to gain a broader understanding of the workings of online learning. The third part of this review focuses on the pedagogical context by examining the philosophical foundations of Quality Schools International as this study is situated primarily within the QSI Virtual School.

II. Technology acceptance

There are many different models seeking to explain technology acceptance and diffusion. Most are built off of the Theory of Planned Behavior (Ajzen, 1991), which posits a positive relationship between intention and behavior. The most popular of all of these theories is the Technology Acceptance Model (TAM), which has nearly reached the status of a paradigm (Bagozzi, 2007) and has been applied in approximately 86% of all studies involving acceptance and persistence in online learning:

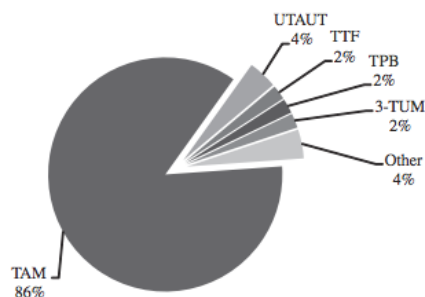


Figure 3: Theories applied in e-learning acceptance studies (Šumak et al., 2011, p. 2070)

A. Technology Acceptance Model

In 1989, Davis et al developed the Technology Acceptance Model to explain both initial technology acceptance and continued use. TAM also attempts to explain how external variables (i.e. the situational context) influence perceived usefulness and perceived ease of use, which in turn influence behavioral intention to use the new technology as illustrated below:

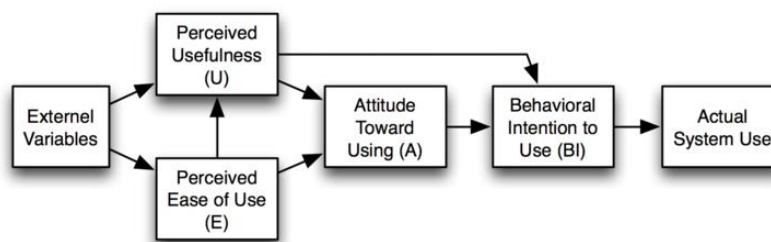


Figure 4: Original Technology Acceptance Model (Davis, 1989)

Despite its broad appeal, TAM only seems to account for 40-50% of variance in user acceptance of a new technology (Park, 2009). TAM was later extended to improve its predictive ability. New constructs were added, extending the model to explain up to 60% variance in user acceptance.

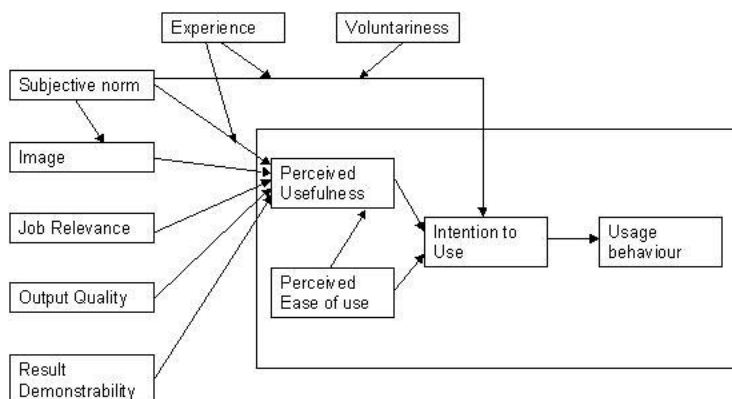


Figure 5: TAM2 (Davis & Vanketesh, 2000)

Still, even with its popularity, TAM is not without its critics. In addition to its poor predictive power, TAM has also been criticized for its limited impact on practice (Chuttur, 2009). Bagozzi (2007) also identified five major shortcomings of TAM, all of which center around a failure to ground the model in a motivational theory that recognizes situational and contextual aspects of energizing behavior or failure to recognize that the individual plays a conscious role in choice behavior based on personal goals.

B. Unified theory of acceptance and use of technology (UTAUT)

Venkatesh et al. (2003) analyzed eight competing models of technology acceptance and use (including TAM and TAM2) and synthesized these constructs into a new model. UTAUT initially employed seven constructs to explain technology acceptance and use but later discarded three when they failed to yield a positive correlation. These constructs seemed to account for up to 70% of variance for acceptance and use, much higher than any of the models used in its creation (Anderson & Schwager, 2004). UTAUT was further articulated with the addition of four moderators (gender, age, experience, voluntariness of use) that the research team believed directly impacted the relationships between constructs:

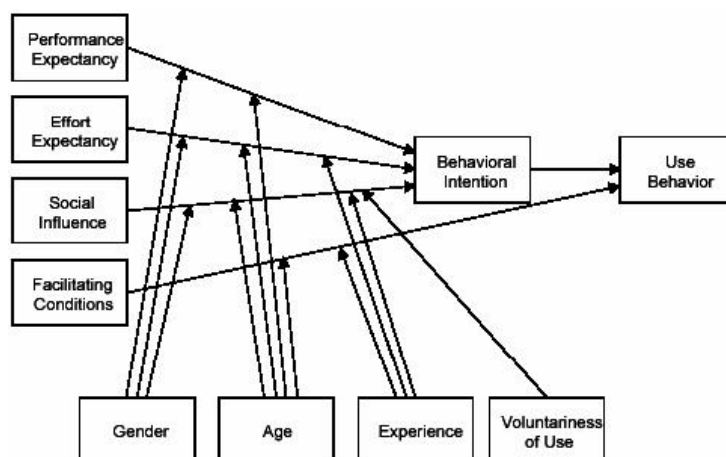


Figure 6: The UTAUT Model (Vanketesh, 2003, p. 447)

UTAUT has been tested empirically in many contexts including virtual learning environments (e.g. Anderson & Schwager, 2004; Sundaravej, 2010; Debuse, Lawley & Shibl, 2008; Owens & Moyle, 2008; Wang & Shih, 2009) as well as in cross-cultural situations (Oshlyansky, Cairns & Thimbelby, 2007). This makes it especially interesting for international schools employing virtual learning programs. In a study of the Kyiv International School Mobile Education Technology (KISMET) system (Snyder 2010), UTAUT was able to account for 90% of variance for acceptance and continued use of the virtual learning environment using a least squares regression in the first testing cycle. UTAUT has proven to be a valuable contribution to the field of technology acceptance and is especially important in defining and evaluating best practices for virtual learning where teachers must find ways of encouraging students to use the virtual learning platform *before* students can meet learning objectives (Martins & Kellermanns 2004; van Raaij & Schepens 2008).

Still, UTAUT is not without its problems. The model weights each construct equally, a situation that is rarely the case in reality (Loch & Huberman 1999; Anderson & Schwager 2004, van Raaij & Schepens 2008). Furthermore, there is some indication that the penetration of the Internet into students' lives lessens the impact of at least two of the constructs in technology applications based on the Internet (Lee, Cheung & Chen, 2005) and that the lack of parsimony of UTAUT also lessens its value as a model (Bagozi, 2007; van Raaij & Schepers, 2008). UTAUT does include a socially based construct but is limited to the social norm, i.e. those people important to me think I should use the new technology. Finally, while UTAUT is derived from the Theory of Planned Behavior (as is TAM and most technology acceptance models) and recognizes that aspects of behavior are volitional, it does not consider innate psychological characteristics that may impact acceptance and use (Reber, 2005; Yoo, Han & Huang, 2012).

C. *Motivational approaches to technology*

Together, TAM and UTAUT represent a very large proportion of technology acceptance research, especially in the domain of online learning but neither is grounded in a rich theory of motivation. This is particularly strange since the definition of behavioral intention would seem to place it squarely into the field of motivation research and a deeper application of motivational theory could help elaborate conditions when applying the models.

Motivational research in an online context has been dominated by attempts to identify the individual characteristics of students that lead to success in online programs (Rovai, 2007; Reid, Aqui & Putney, 2009). Very few attempts have been made to apply motivational research as a means of building *supports* into online class structures, policies and/or procedures, thereby increasing achievement and/or acceptance of the medium. Much of the existing research has either had low validity (Bernard et al., 2009), or has been situated in higher education contexts (Cavanaugh et al., 2004; Huett, Foshay & Coleman, 2008). The relevance of higher education studies remains a concern in this study but are valuable as a starting point. Additionally, as online learning begins to penetrate more deeply into the K12 context, more work should to be done within it in order to understand theories of technology acceptance embedded into context (Fullan, 1999).

Lee, Cheung and Chen (2005) sought to integrate motivation theories into TAM. They felt that the model's weakness was in explaining technologies incorporating human and social processes. They also found that the interactive tools of virtual learning environments might increase perceived enjoyment and thereby increase intrinsic motivation to use the technology.

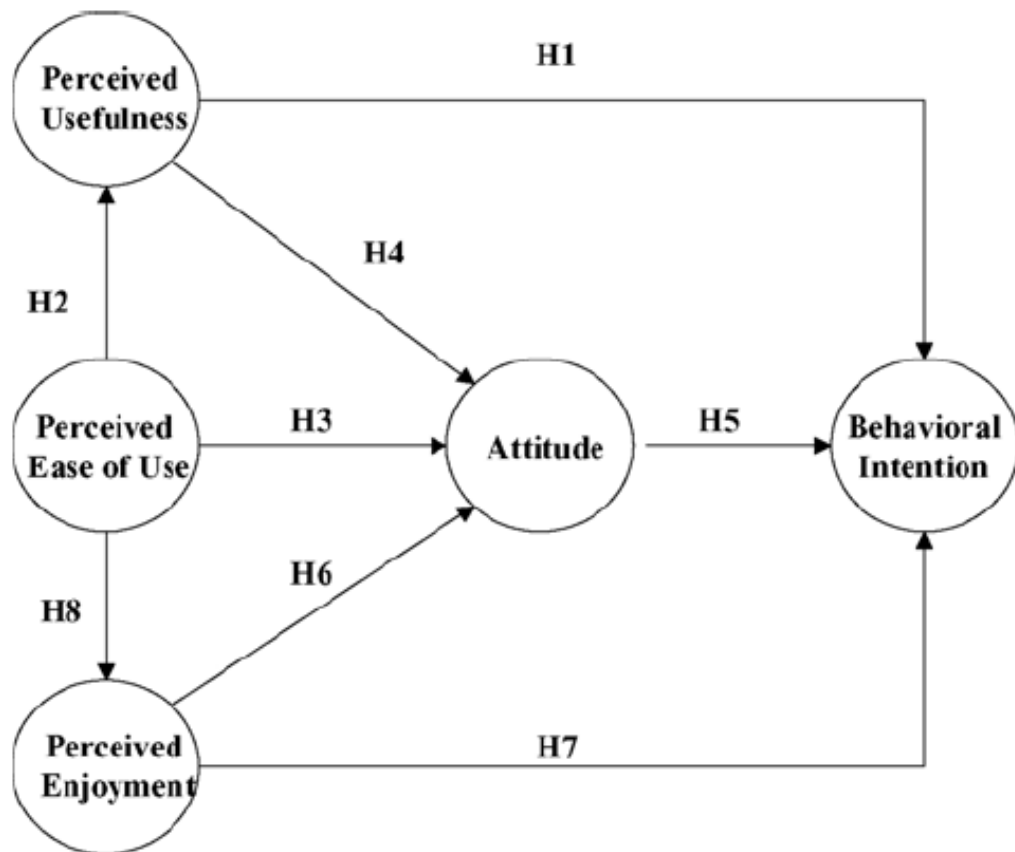


Figure 7: Lee, Cheung and Chen's Research Model

This model was an attempt to gain a deeper understanding of models like TAM and by applying aspects of motivational theories to the technology acceptance models. However, placing technology acceptance models at the forefront of their study and then mapping motivational theories to them ignored important elements of motivation. Perhaps a wiser approach would be to start with theories of motivation and then embed the specific constructs of technology acceptance models within them. Furthermore, it could be argued that Perceived Enjoyment is already an indicator of positive attitude as concepts such as fun and enjoyment are related to more autonomous forms of motivation (see below). In this case, Perceived Enjoyment would not be related to Attitude but would be another way of describing it.

III. Theories of Motivation

According to Xie and Ke (2011), a desired learning outcome will not be successful unless it is energized. Motivation is the key to the energizing process and when *not* supported can form a barrier to successful acceptance of learning behaviors (Tushman, Newman & Romanelli, 1987). This is echoed by several researchers examining the characteristics of motivation leading to increased engagement and capacity within learning behaviors (Liou & Kuo, 2014, Harnett, St. George & Dron, 2014; Butz et al., 2014). Motivation has been defined in several different ways but for the purpose of this study, I have used the definition put forth by Shrunk and Usher (2012, Ch. 2), “motivation is the process whereby goal-directed activities are energized, directed, and sustained.” This focus on both process and goal-directed activities is highly appropriate in investigating learning innovations.

In the 1950’s the concept of intrinsic motivation began to take shape out of the work of Harlow (1953) and White (1959) as behaviors “that are not energized by physiological drives or their derivatives and for which the reward is the satisfaction associated with the activity itself (Vansteenkiste, Lens & Deci, 2006, p. 20).” Around the same time, cognitive theorists began to take on a central position in the field of psychology, recognizing the role of conscious choice in motivation (Shrunk & Usher, 2012). These two theories remained at odds until Deci and Ryan (1985) proposed a new theory where both external conditions and intrinsic needs could account for energization of behavior (Harnett, St. George & Dron, 2011; Deci & Ryan, 2012). Self-determination theory (SDT) examines motivation as a multidimensional concept, expounding upon the dynamics of human needs, qualities of motivation and psychological well-being within a social context (Chen, 2007; Rocca & Gagne, 2008). Furthermore, SDT is “one of the most comprehensive and empirically

supported theories of motivation today (Pintrich & Shrunken, 2002, p. 257)” and has considerable generalizability in the field of education, having been applied to studies from elementary through medical school (Deci & Ryan, 2000a).

SDT holds that “humans are active, growth-oriented organisms who are naturally inclined toward integration of their psychic elements into a unified sense of self and integrations of themselves into larger social structures (Deci & Ryan, 2000, p. 229).” In other words, SDT acknowledges that people are born with psychological needs and the fulfillment of these needs takes place in an interchange between the individual and the social environment. SDT identifies three needs that must be satisfied in order to achieve psychological well-being and we, as educators, must garner an appreciation for how these needs may be supported (Zepke, Leach & Butler, 2009). However, despite the obvious value of SDT in explaining motivation in online learning environments, it has been largely ignored in the field (Chen 2007). This study is grounded in SDT due to its wide use in education and the broad-based motivation focus which recognizes internal drives as well as conscious choices.

A. Needs

SDT defines a need as something that is innate and organismic rather than something that is learned or acquired. When these needs are met, they promote psychological well-being and positive motivation. In other words, the identified needs of Autonomy, Competence and Relatedness could be considered as psychological nutrients, feeding our minds and bodies, allowing us to be healthy, energized individuals (Ryan & Deci, 2000a, Ryan & Deci, 2000b).

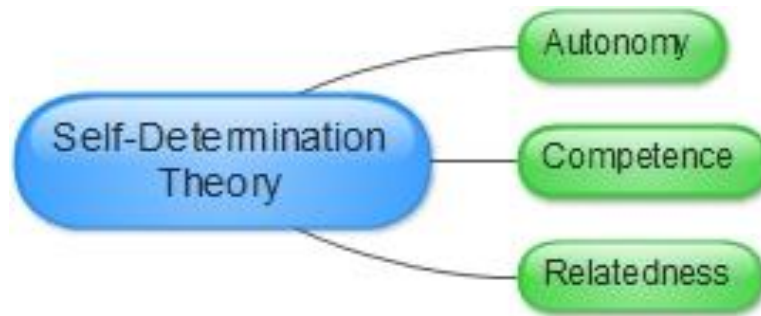


Figure 8: NEEDS of Self-determination theory

Since these three needs are hypothesized to be innate and universal, all three play a part in the development of the individual and none can be ignored without considerable negative consequences. Additionally, SDT accepts the importance of context for need fulfillment and the role that cultural norms play in supporting or hindering need fulfillment. When the needs are not met, anxiety, grief, and hostility may arise and may lead to a lower state of motivation or even to a condition of amotivation. Still, while SDT posits the universality of each need, SDT research has focused heavily on Autonomy (Katz & Assor, 2007) and has often ignored Relatedness and has even portrayed it as antagonistic to Autonomy (Ryan & Deci, 2000a). Ryan and Deci (2000b) themselves admitted that they stressed Autonomy much more than either other need in their research. Furthermore, Relatedness has often been portrayed as a support to Autonomy and/or Competence or relegated to a means in aiding the internalization process (See below). Thus, a deeper understanding of each of the basic psychological needs could have significant consequences for technology acceptance and instructional design in general (Ryan & Deci, 2000a; Ryan & Deci, 2000c; Guyen, 2013).

From a motivational stance, “the satisfaction of these basic needs promotes autonomous motivation (See below) and effective performance (Harnett, St. George & Dron, 2004, p. 33).” Cheng and Jang (2010) applied this understanding to the online context and

found a strong mediating influence on motivation by satisfaction of the basic needs. Niemiec and Ryan (2009), focusing on intrinsic motivation in the classroom, came to a similar conclusion. However, their stance failed to even attempt to incorporate Relatedness, a condition that is all too common in the literature where it remains an under-explored need.

B. Quality of Extrinsic Motivation

Autonomy, Relatedness and Competence form the cornerstone of Self-determination theory but an additional contribution that has emerged from the theory addresses the *quality* of motivation (Roca and Gagne, 2008). While early conceptualizations of motivation centered on an antagonistic view of intrinsic versus extrinsic motivation, SDT holds that extrinsic motivation takes many forms (Deci & Ryan, 1985; Ryan & Deci, 2000b) and may enhance intrinsic motivation (Vansteenkiste, Lens & Deci, 2006). While extrinsic motivation refers to performing a behavior in order to achieve a consequence separable from the behavior itself (Ryan & Deci, 2000c; Roca & Gagne, 2008), extrinsic motivation is no longer understood solely as a controlled external force, i.e. rewards vs. punishments. SDT recognizes that it is possible to internalize external values and goals that represent an aspect of self whereby the desired actions become internally regulated instead of externally regulated (Deci & Ryan, 2012). Indeed, many of the activities that we require students to engage in are not intrinsically interesting to them but have high utility value and can therefore come to be internally regulated (Ryan & Deci, 2000a; Harnett, St. George & Dron, 2011).

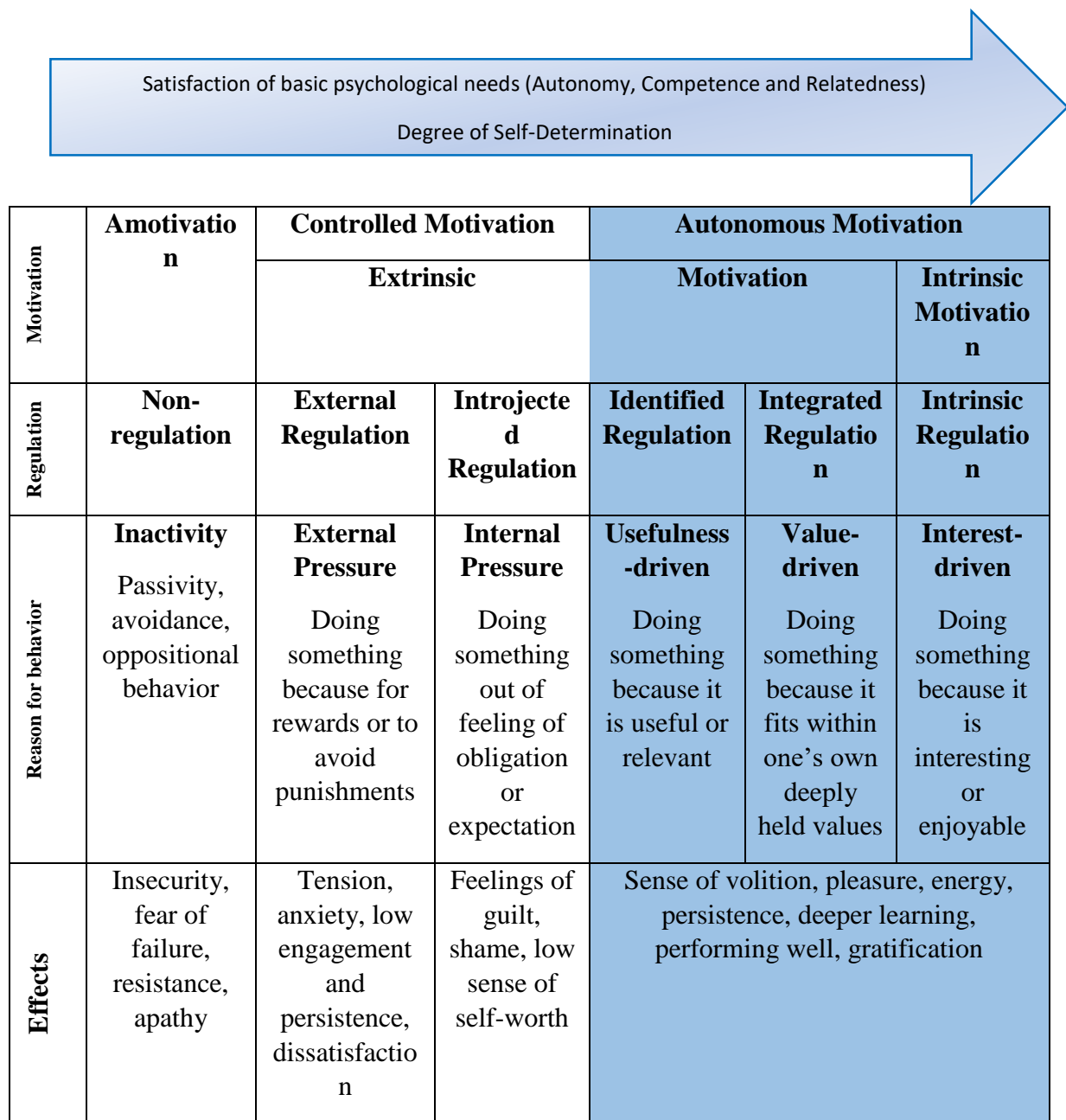


Figure 9: Motivation continuum (Adapted from Deci & Ryan, 2000a; Visser, 2017)

One of the most valuable contributions that SDT has made is to conceptualize motivation as a malleable continuum and articulate extrinsic motivation based on types of regulation (Ryan & Deci, 2000a). At the far left of the continuum is an amotivated state where the behavior is simply not energized. At the far right of the continuum is intrinsic motivation, where the behavior is engaged in based on its own innate satisfaction. Where

SDT differs from other theories is that it further distinguishes extrinsic motivation into four types based on the level of regulation that energizes the behaviors:

As seen in the figure above, SDT recognizes four different qualities of extrinsic motivation. **External regulation** is the classically understood example of extrinsic motivation, whereby individuals engage in a behavior to avoid punishment or receive a reward. **Introjected regulation** is characterized by behaviors based on internal feelings of obligation, often derived from the social environment and very often energized or accompanied by guilt, pressure, anxiety or, conversely, to enhance a sense of ego, e.g. to achieve feelings of pride (Ryan & Deci, 2000a; Ryan & Deci, 2000c; Assor, Roth & Deci, 2004; Vansteenkiste, Lens & Deci, 2006; Chen, 2007). **Identified regulation** occurs when individuals recognize the value in undertaking a behavior but the motivations to accomplish it remain external to self. Put another way, identified regulation occurs when individuals identify with the value of the behavior for their personal goals, values, etc. (Ryan & Deci, 2000a; Chen, 2007; Liu et al., 2009; Deci & Ryan, 2012). **Integrated regulation** is the most internalized example of extrinsic regulation. Individuals integrate the behaviors into their own personal schema and undertake them completely of their own volition (Ryan & Deci, 2000a; Deci & Ryan, 2012). The main difference between identified regulation and integrated regulation is that, “with the former, people engage in a behavior for instrumental reasons (achieving a personal goal) whereas with the latter, people engage in a behavior out of enjoyment (Roca & Gagne, 2008, p.1589),” making it much closer to intrinsic motivation in nature but still external to self. People experience this type of motivation when they have fully integrated a motivation into themselves, based on their deeply held values. Unlike intrinsic motivation, they do not engage in the activity *purely* out of enjoyment for the activity itself.

Therefore, “unlike some perspectives that view extrinsically motivated behavior as invariantly non-autonomous, SDT proposes that extrinsic motivation can vary greatly in its relative Autonomy (Ryan & Deci 2000a, p. 71).” Some researchers eschew the terms extrinsic and intrinsic motivation, choosing instead to identify motivation as either controlled or autonomous. Autonomous motivation describes a healthier, more energized condition that educators value and seek to support in students (Bachman & Stewart, 2011; Harnett & St. George, 2011; Deci & Ryan, 2012). This study distinguishes between controlled and autonomous motivation as it is more reflective of educational goals, i.e. not everything will be intrinsically motivating but teachers can still strive for autonomous motivation resulting in a sense of volition, pleasure, energy, persistence, deeper learning, feelings of performing well and gratification.

The movement toward understanding motivation as a dynamic continuum instead of a static dichotomy between intrinsic and extrinsic motivation has huge implications for instructional design, engagement, online learning and technology acceptance (Deci & Ryan, 1985; Ryan & Deci, 2000b; Ryan & Deci, 2000c; Punnoose, 2012; Yoo, Han & Huang, 2012; Liou & Kuo, 2014). Student-centered classrooms that develop students’ perceptions of Autonomy, Relatedness and competency enhance autonomous motivation, producing students that are more *engaged*, successful, *persistent* and creative (Ryan & Deci, 2000a; Chen, 2007; Harnett & St. George, 2011; Liou & Kuo, 2014). Conversely, when instructional design focuses on controlled motivation techniques, this lack of perceived Autonomy creates negative pressure, tension and ambivalence, inhibiting students from progressing to the more self-regulated stages of extrinsic motivation (Ryan & Deci, 2000b; Chen, 2007). Ryan and Deci (2000a, p. 73) add that, “the more students were externally regulated the less they showed interest, value, and effort toward achievement and the more they tended to disown responsibility for negative outcomes, blaming others such as the teacher.”

Although Self-determination theory is only beginning to emerge as a tool to study motivation in an online context, there is a good indication that it provides a strong explanatory framework to understand the complexities of motivation in this context. Furthermore, the basic constructs of technology acceptance models could very well be framed in terms of supports or hindrances to autonomous forms of motivation (Yoo, Han & Huang, 2102). For example, looking at ways to enhance performance expectancy could be seen as a support of Competence. Understanding that the social norm is a form of controlled motivation could help teachers to build in supports for Relatedness that are more supportive of identified or even integrated goals. There is further evidence to support the claim that autonomous extrinsic motivation may actually be more important than intrinsic motivation in the workplace and classroom, as not everything that we ask students or employees to do is intrinsically interesting (Vanketesh et. al., 2002; Leper et al., 2005; Hadre, et al., 2006; Fagan, Neil & Woolridge, 2008; Guay, et al., 2008; Roca & Gagne, 2008; Niemiec & Ryan, 2009). A limitation of many studies to date has been to focus on innate learner characteristics and intrinsic motivation, ignoring other types of extrinsic motivation that are autonomously regulated and useful to instructional designs (Harnett, St. George & Dron, 2011; Yoo, Han & Huang, 2012). Finally, it is important to note that as we build in supports to our instructional designs, we must recognize that the motivational continuum is not a static, one dimensional model and that any given behavior can be energized by *more than one* of these motivations at the same time (Deci & Ryan, 2012).

C. Internalization

Internalization is the taking of a value or regulation into self so that, “it will emanate from their [individual] sense of self (Ryan & Deci, 2000a, p. 71a).” This represents the growth-oriented nature of human beings (Vansteenkiste, Len & Deci, 2006) and it is through

this process that individuals can be extrinsically motivated and yet have that motivation be authentic (Ryan & Deci, 2000c). According to Deci and Ryan (2012), this process is an evolved developmental tendency existing in all individuals in order to internalize values, attitudes, cultural norms, etc. that exist in the external world. In order for this to happen, individuals must *consciously understand* their importance and assign personal meaning to them with respect to their existing values and motivations and in ways that are supported by their feelings of Autonomy, Relatedness and Competence (Deci & Ryan, 2000; Vansteenkiste, Lens & Deci, 2006). Furthermore, one of the main tenants of SDT is that individuals and their sense of self exist within a socio-cultural context where the values and norms of the context have an influence on the internalization process (Deci & Ryan, 2000; Ryan & Deci, 2000a; Ryan & Deci, 2000b; Hadre et al., 2006; Zepke, Leach & Butler, 2009). Instructional designs can increase internalization of student motivation by building supports that deepen the level of autonomous regulation.

While the internalization process may be an innate characteristic of all individuals, Deci and Ryan (2000, p. 229) are careful to point out that it will only operate optimally, “to the extent that the nutriments [Autonomy, Relatedness and Competence] are immediately present, or, alternatively, to the extent that the individual has sufficient inner resources to find or construct the necessary nourishment.” Thus, internalization and integration are optimized through supports of Autonomy, Relatedness and Competence (Ryan & Deci, 2000b; Hadre et al., 2006; Rigby & Przyblski, 2009). For example, when positive feedback is coupled with Autonomy supports in a way that students feel is informative not controlling, it is likely to enhance autonomous motivation (Deci & Ryan, 2012). This has tremendous importance in the fields of both education and technology acceptance where individuals are continually being asked to engage in activities that they do not find intrinsically motivating. Through careful planning and design, educators can create situations that support the three basic needs,

resulting in sustained autonomous academic motivation and greater self-regulation (Chen, 2007). If support for the three basic needs is ignored in online instructional designs, the academic environment can reduce students' autonomous motivation (Hadre et al., 2006), leading to a disastrous situation for this newly developing and highly scrutinized field.

D. Motivation and the three psychological needs

1. Autonomy

Autonomy is the most investigated need within SDT studies (Ryan & Deci, 2000a). The centrality, therefore, of Autonomy to SDT makes understanding the concept imperative and yet, it is the most frequently misunderstood. Autonomy is a condition of integration and freedom, “the organismic desire to self-organize experience and behavior and to have activity be concordant with one’s integrates sense of self (Deci & Ryan, 2000, p. 231).” It is not an expression of independence versus control. Still, many researchers have equated Autonomy with choice or independence. For example, Bachman and Stewart (2011, p. 184) found that, “perceptions of Autonomy support involve the experience of volition and choice; whereas feeling controlled involves the experience of being pressured or compelled to do something.” While choice may explain some aspects of Autonomy (Zuckerman, et al., 1978), it provides an inaccurate or at least incomplete picture. Instead, the need for and acts of Autonomy should be thought of as being consistent with internal drivers and aspirations, both voiced and unvoiced, individualist or collectivist, dependent or independent. It is a need, “fully endorsed by the self and thus in accord with abiding values and interest (Ryan & Deci, 2006, p. 1560). Our understanding of Autonomy must also include other aspects such as goals, volition, interest, and values that accompany a striving for self-determination and self-realization (Ryan & Deci, 2000a; Katz & Assor, 2007; Harnett, St. George & Dron, 2014).

Therefore, when looking at Autonomy as a motivating influence, the value that individuals give to a task comes into play (Deci & Ryan, 2000c). When tasks are consistent with an individual's authentic self, or they at least understand the value or relevance of the task, it is much more likely to be an Autonomy-supported task and have a higher autonomous motivational value than those disconnected with personal goals (Deci & Ryan, 2000c; Fullan, 2003; Assor et al., 2005; Katz & Assor, 2007; Souto-Otero, 2009). One way of achieving this in an organization like a school is to continually support the development of a personal vision as a part of an institutional shared vision so that the tasks associated with successful completion of educational tasks are understood and valued by the students and teachers alike. (Senge, 1990; Fullan, 1993; Ryan & Deci, 2000b; Rovai, 2001; Hargreaves & Fink, 2004; Allen, 2005). Unfortunately, there is also ample evidence that practices in education often threaten Autonomy, leaving students feeling powerless and amotivated in their studies (Hargreaves, Earl & Ryan, 1996; Deci & Ryan, 2000; Sigles & Momino, 2007; Bachman & Stewart, 2011; Boling, et al., 2012).

The need for Autonomy has several implications for online learning. Autonomy-supportive contexts in online classes lead to higher levels of engagement and motivation, especially in tasks that may be initially uninteresting to students (Hadre & Reeve, 2003; Deci, et al., 1994; Roca & Gagne, 2008; Joussement, et al., 2004). Reeve et al. (2004, p. 149) found that “students with Autonomy-supportive teachers compared to students with relatively controlling teachers, show greater mastery motivation, perceived Competence and intrinsic motivation...and greater persistence in school.” Furthermore, Tunison and Noonan (2001, p. 503) found that, “the most common student response to the questions of benefits of a virtual school was their appreciation of Autonomy and freedom.”

2. Competence

The need for Competence refers to a person's need to feel successful in his/her interactions with the external environment and in mastering appropriately complex challenges and tasks (Deci & Ryan, 1985, 2000a; Bachman & Stewart, 2007; Katz & Assor, 2007). It is interesting to reinforce the concept of mastery as both the underlying philosophical approach within QSI (see the question of context below) as well as a strong supporter of Competence in a wide range of educational settings (Shrunk & Usher, 2012). Competence has been linked to instances of higher motivation and achievement in a wide variety of motivational studies in education in general (e.g. Hadre & Reeve, 2003; Lin, Lin & Laffey, 2008; Lyllimyr, Sobstad & Marder, 2008; Robyler et al., 2008) as well in the field of technology acceptance and use (e.g. Ramayah, Jantan & Ismail, 2003; Fagan, Neil & Woolridge, 2008; Roca & Gagne, 2008; Xie & Ke, 2011; Bachman & Stewart, 2011; Yoo, Han & Huang, 2012).

Wigfield, Cambria and Eccles (2012) believed that it is up to the teachers to create a Competence-supportive environment by setting transparent and achievable criteria for success in classroom activities. In order to achieve maximum support for Competence, instruction should build off of prior knowledge (Hargreaves, 2007), be developmentally appropriate (Ryan & Deci, 2000b), and be challenging enough to engage the students while not being so challenging as to lead to anxiety (Deci & Ryan, 2000).

Some studies have concluded that Competence may be a more important motivational support than either Autonomy or Relatedness (Zepke, Leach & Butler, 2009). However, I would caution taking this as anything more than a strong validation of the importance of Competence. Indeed, Ryan and Deci (2000a, p. 70), held that “feelings of Competence will not enhance intrinsic motivation unless accompanied by a sense of Autonomy,” while Wigfield, Camria and Eccless (2012) as well as Zepke, Leach & Butler (2009) also indicated

the importance Relatedness in supporting feelings of Competence. There are strong indications that feelings of Competence have an impact on feelings of Autonomy and Relatedness, making each of the motivational needs a reinforcing agent for the other two, expressed situationally and personally in different ways (Ryan & Deci, 2000a; Hadre et al., 2006). Competence, like Autonomy and Relatedness, is a single need that must be supported in conjunction with the other two needs.

Chen (2007) found that online courses are well suited to Competence-supportive designs that are based on appropriately challenging tasks fostering feelings of self-efficacy. Online learning is also often chunked into small modules, enabling the teacher to determine remediation and acceleration, based on mastery of discrete learning objectives (Vrasidas & McIsaac, 2000; Hargreaves, 2007). One of the key, Competence-supportive benefits often cited in the literature is the pacing of online learning. Students are able to review material they find difficult at their own pace and glance over material they easily master (Hughes & Bruce, 2005; Greenway & Vanourek, 2006; Guyan, 2013). Not being bound to a timetable allows students to think and reflect on the learning activities, thereby making more productive contributions to discussions (Vrasidas & McIsaac, 2000; Zucker & Korma, 2003; Hassel & Terrell, 2004; Hughes, & Bruce, 2005; Lowes, 2005; Fischer, 2009; Bauerline, 2011). Finally, online systems can provide constant, immediate and varied feedback to students around difficult concepts, allowing them to reflect on their understanding and critically examine their learning skills (Debusse, et al., 2008; Fischer, 2009; Bachman & Stewart, 2011; Guyan, 2013).

While online learning designs can certainly be supportive of the need for Competence, there are challenges as well which may thwart this need's satisfaction. Due to its highly text-based nature, students with language difficulties may become quickly

frustrated if their needs are not accounted for (Shollie, 2001). Furthermore, teachers new to online learning often overcompensate for what they perceive as a loss of instructional time by creating “busy work” for students. This decreases task-value, a Competence-undermining situation (Bachman & Stewart, 2011). Finally, while thoughtful responses are gained in online learning, the quick, risk-taking element of class debates is lost (Stodel, Thompson & MacDonald, 2006).

3. Relatedness

The social worlds of children are a pervasive and influential part of their lives at school. Each day in class, children work to maintain and establish interpersonal relationships, they strive to develop social identities and a sense of belongingness, they observe and model social skills and standards of performance displayed by others and they are rewarded for behaving in ways that are valued by teachers and peers (Lillimyr, Sobstad & Marder, 2008, pp 2-3).

All of the daily interactions in the quotation above are a part of the Relatedness need and therefore a basic psychological need of our students according to SDT. Ryan and Deci (2002, p. 7) found that, “Relatedness refers to feeling connected to others, to caring for and being cared for by those others, to having a sense of belongingness both with other individuals and with one’s community.” The internal importance of connectedness, caring and belonging is also echoed in the work of other researchers (e.g. Furrer & Skinner, 2003; Katz & Assor, 2007; Guay, et al., 2008; Lin, Lin & Laffey, 2008; Roca & Gagne, 2008; Bachman & Stewart, 2011; Deci & Ryan, 2012). Lillimyr, Sobstad & Marder (2008) concluded that Relatedness is not only fundamental to motivation but also to self-concept, an idea very much in line with SDT’s premise that Autonomy, Competence and Relatedness supports are required for psychological well-being.

Relatedness is critical in promoting autonomous motivation in children (Furrer & Skinner, 2003). Building in Relatedness supports is very important to ensure a positive

learning environment where students are autonomously motivated to engage in goal-oriented behaviors to succeed (Hadre, et al., 2006; Wigfield, Cambria & Eccles, 2012). It is also an essential part of the learning experience and has been linked to stronger positive feelings about the educational experience and institutions of learning, leading to better work habits, self-efficacy, self-esteem and, ultimately, more academic success (Furrer & Skinner, 2003; Lillimyr, Sobstad, & Marder, 2008; Beachboard, et al., 2011; Thomas, Herbert & Teras, 2014). Perceptions of positive Relatedness have also been shown to lead to higher levels of engagement in the classroom (Furrer & Skinner, 2003; Wigfield, Cambria & Eccles, 2012; Thomas, Herbert & Teras, 2014) and increased behavioral use intention in technology acceptance studies (Li, Day, Lou, & Coombs, 2004).

When SDT was a relatively new theory of human motivation and well-being, many researchers found the inclusion of Relatedness as a basic human need to be uncomfortable (Ryan & Deci, 2000a). In 2003, Furrer and Skinner noted that the use of Relatedness as a factor in motivation was relatively new. However, fifteen years later and more than thirty years after the initial formulation of SDT as a theory, Lillimyr, Sobstad and Marder (2008) found that Relatedness was still an oft-neglected aspect of educationally-based motivational studies, limited at best to a distal role (Deci & Ryan, 2000), a support for Autonomy and Competence (Harnett, St. George & Dron, 2014), or as a facilitating influence for the process of internalization (Ryan & Deci, 2000c; Guay, Marsh & Senecal, 2008; Roca & Gagne, 2008; van Raaij & Schepers, 2008; Niemiec & Ryan, 2009; Deci & Ryan, 2012). Perhaps this is because Ryan and Deci (2000b) themselves admit that they put more effort into explaining the dynamics of Autonomy than either Competence or Relatedness. Perhaps in our quest for indicators of personal achievement and individualization of instruction, we have forgotten that learning is an inherently social endeavor and have suppressed our understanding of it.

This downgrading of Relatedness as a need appears over and over again in the literature. In 2003, Hadre and Reeve sought to apply Self-determination theory to a study of persistence in rural high school students. They focused almost entirely on Autonomy and Competence, limiting Relatedness to teacher-based supports of Autonomy. Guay, Marsh and Senecal (2008) sought to study the impact of Relatedness with parents and friends on autonomous academic motivation but relegated Relatedness to the concept of the subjective norm. In a 2009 study on student motivation and engagement in learning, Zepke, Leach and Butler totally ignored any hint of Relatedness, choosing instead to focus on Competence and self-efficacy. Wigfield, Cambria and Eccles (2012) chronicled general studies of human motivation in education but chose to focus almost exclusively on competency supportive constructs. A 2009 study supposedly grounded in SDT went so far as to state that “intrinsic motivation is sustained by the satisfaction of the basic psychological needs for Autonomy and Competence (Niemic & Ryan, 2009, p. 135),” ignoring Relatedness as a need in its entirety. In 2008, Roca and Gage attempted to apply Self-determination theory to e-learning continuance but also reduced the importance of Relatedness to that of the subjective norm. In 2010, Lee developed a predictive model for persistence in online learning that did not include any Relatedness concepts. Chen and Jang (2010, p. 743) developed and tested a motivational model for online learning based on Self-determination theory yet stated, “Relatedness support was not included in our model because Autonomy and competency supports are more directly addressed by SDT.” Punnoose (2012) limits the importance of Relatedness to extroverted individuals while Sjøebø and Hæhre (2012, p. 357) explicitly stated that “Relatedness is not expected to be of the same importance as Autonomy and Competence in the development of self-determined types of motivation.” This neglect of Relatedness negatively impacts our understanding of Self-determination theory, technology acceptance and motivation in

general. Without a deeper understanding of Relatedness, we fail to understand a basic need of students and one that could potentially enable virtual learning environments to thrive.

a) Relatedness and Psychological Sense of Community

According to Schlechty (1990, p. 50), "...the way purposes are articulated and the way vision is expressed must take into account the needs and values of those who are expected to act on these expressions." Therefore, if technology acceptance models, even those grounded in motivational theories, fail to take into account the needs of the students (and Relatedness is a basic psychological need according to SDT), then the theories and the instructional design models arising from them, will fail to achieve their maximum predictive values and benefits for students.

Butz and Stupinski (2017) found very few studies listing the basal components of any of the needs in Self-determination theory. The strange thing is that there is an entire branch of psychology that seeks to describe the importance of Relatedness and its basal components. Yet this branch has not been integrated into either technology acceptance or SDT studies. In community psychology, community has been defined as, "a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together (McMillan & Chavis, 1986. p. 9)." This is incredibly similar to the definition of Relatedness put forth by Ryan and Deci (2002, p. 7) as, "feeling connected to others, caring for and being cared for by others, of belongingness both with other individuals and with one's community."

In studies investigating sense of community in face to face as well as online contexts, several key motivational and instructional benefits emerge, including: higher *engagement* (Wright, 2004; Gulati, 2008), greater *persistence* (Rovai, Whiting & Lucking, 2004; Robyler et al., 2008), greater feelings of accomplishment in learning and participation in learning

activities (Sadera, et al., 2009), greater feelings of well-being (Rovai, 2001; Pretty, et al., 2006), a sense of caring for and being cared for by classmates and teachers (Harnett, St. George & Dron, 2014), a reduction in feelings of *isolation* (Rovai, 2001; Rovai, 2002), and overall higher course satisfaction (Delahunty, Verenikina & Jones, 2014).

McMillan and Chavis (1986) originally elaborated on the sense of community by proposing it has four dimensions: membership, influence, integration and reinforcement, and emotional connection. These dimensions help to explain sense of community more thoroughly and may deepen our understanding of Relatedness within SDT. Membership is the feeling and sharing a personal closeness to others. Influence is feeling a sense of purpose that one's decisions and actions in the community matter. Integration and reinforcement of needs is the feeling that one's needs are being met by being a part of the community. Finally, emotional connection is the belief that members have similar experiences and history. All four dimensions in the sense of community directly speak to concepts of Relatedness. By using sense of community to explore concepts of Relatedness, SDT can gain access to another, rich body of literature that is lacking within itself.

Historically community has been seen through the lens of “geographically defined communities (Delahunty, Verenikina & Jones, 2014, p. 252).” However, as early as 1975, Gusfield separated community into territorial and relational subcategories. With the rapid developments in transportation and telecommunications technologies, the territorial requirements of community have faded even further (Rovai, Wighting & Lucking, 2004). Non-territorial sense of community, therefore, becomes especially important when considering the virtual classroom where it has been successfully employed to study online communities (in e.g. Rovai, 2002; Tsai et al., 2008; Sadera, et al., 2009).

b) Relatedness and community through interaction

Sense of community research offers deeper insight into concepts of Relatedness in general but is particularly useful in online learning where a limited sense of community has led to feelings of isolation, distraction and connection to teachers and peers (Rovai, 2011). Indeed, developing a sense of community has been cited as a vital component in any online program and lack thereof a deciding influence for those who drop out of online programs (Boling et al., 2012; Lee, Choi & Kim, 2013; Delahunty, Verenikina & Jones, 2014). However, describing sense of community is only a first step. We must then use this new understanding to develop Relatedness supports in our instructional designs and thereby strengthen autonomous academic motivation in our virtual classrooms.

If Relatedness or sense of community is the important *what* that is too often missing from technology acceptance and motivational studies, interaction could be the missing *how* these feelings can be developed. Roblyer, et al. (2008) believed that high levels of social collaboration could increase delivery medium satisfaction. Thomas, Herbert and Teras (2014) supported the importance of community building through interaction in web-based learning. Tsai et al. (2008, p. 201) found that “students’ active participation is often seen as the critical element in the formation of a learning community and building a sense of community in online classes,” while Delahunty Verenikina, and Jones (2014) believed that interaction plays a fundamental role in developing a sense of community in an online context. Finally, according to Price and Oliver (2007, p. 21), interaction is the critical element to develop a sense of community, or in their words, for “developing group cohesiveness, unification and working toward mutual goals.”

In order to study the impact of interaction on sense of community, Relatedness and autonomous motivation, it becomes necessary to define interaction. For the purposes of this

study, I have adopted Swan's (2001) classification of interactions as student-student, student-teacher, and student-content, the latter taking on a larger role in online learning where content is often distributed to the individual through the virtual learning system itself.

(1) Student-content interaction

In order to study student-content, Ertmer, Sadaf & Ertmer (2011) looked at the impact of question prompts on student motivation. Joksimovic et al. (2015) found that time spent on student-system interactions had a significant impact on achievement. Given that online courses lack interpersonal interactions such as gesture, voice and interactive immediacy (Delahunty, Verenikina & Jones, 2014), it should be no surprise that interactions with the content and the system itself could have a major impact on student motivation and achievement. How this advances in a world where the content itself has a voice (i.e. through avatars such as Siri and Cortana or through the disembodied voice of online lecturers) remains to be seen. Although this type of interaction transcends the primary scope of this study, it is an interesting phenomenon and would bear greater scrutiny in future studies.

(2) Student-teacher interaction

Currently, most of the research on the impact of interaction on motivation has focused on adult-child interactions (Moller 1998; Furrer & Skinner 2003; Lillemyr, Sobstad & Marder, 2008; Tsai et al., 2008; Zepke, Leach & Butler, 2009; Punnoose, 2012). Thomas, Herbert and Teras (2014) found that student-teacher interactions contribute directly and strongly to a sense of belonging in the online class while Watson (2005) found that these interactions are indicators of the overall quality of the experience for students in online classes. Lack of strong student-teacher interactions has been listed as a demotivating force, blocking certain dimensions of learning (Fischer, 2009). Finally, student-teacher interactions have also been linked to the internalization process, supporting more self-determined aspects

of autonomous motivation (Hadre et al., 2006; Fischer, 2009; Wigfield, Cambria & Eccles, 2012).

In order to achieve quality student-teacher interactions, several models have been employed. Some programs see it as the teacher's role to facilitate all online interaction (Wicks, 2010) while other programs require scheduled student-teacher contacts via phone, email and sometimes in person (Reid, Aqui & Putney, 2009). Some programs encourage online teachers to share personal experiences as a way of developing a stronger sense of Relatedness (Delahunty, Verenikina & Jones, 2014; Harnett, St. George & Dron, 2014). Some programs, however, dismiss the primacy of the teacher in course interactions and conceptualize the teacher only as a model for appropriate and sustained interaction (Vansteenkiste, Lens & Deci, 2006; Katz, & Assor, 2007; Boling et al., 2012; Delahunty, Verenikina & Jones, 2104)

(3) Student-student interaction

Relatedness may be a neglected area of research in motivation studies but the impact of peers on academic motivation and achievement is even less examined (Furrer & Skinner, 2003). In the few studies presently available, there is some evidence that the strength of peer interactions is positively correlated to autonomous academic motivation (e.g. Guay, Marsh, Senecal & Dowson, 2008). In an online context, some studies seem to indicate student-student interaction may even have a stronger impact on autonomous academic motivation than student-teacher interactions (Furrer & Skinner, 2003; Lin, Lin & Laffey, 2008; Wigfield, Cambria & Eccles, 2012).

In a traditional educational setting, students exist in several communities at once. Learning communities function to achieve academic goals and are often dominated by a teacher who shapes the Relatedness supports for autonomous motivation (Hadre et al., 2006).

Students are also members of social communities of peers that have tremendous impact on their motivation (Wighting, 2009). Both learning and social communities can support Relatedness needs in students but social communities typically have not been shown to support the development of autonomous academic motivation (Ryan, Stiller & Lynch, 1994). This is especially unfortunate given the increasing influence and interdependence of peer groups on young adolescents, which can eclipse parental and teacher influence (Hargreaves, Earl & Ryan, 1996; Furrer & Skinner, 2003; Lillimyr, Sobstad & Marder, 2008). However, membership in an online classroom community is a unique situation where students come together in short-term, directed groups and interactions are likely taking place nearly exclusively around academic topics (Price & Oliver, 2007; Thomas, 2009; Xie & Ke, 2011). In such a setting, social communities are more intertwined with learning communities, resulting in increased student-student academic interactions and the rise in the importance of peers in developing autonomous academic motivation (Li, et al., 2004; Guary, Senecal & Dowson, 2008; Delahunty, Verenikina & Jones, 2014).

With a growing sense of self and exploration of their place in the world, a student's influence on the academic community becomes more important for ensuring high levels of engagement. According to sense of community research, this would be important in any learning community but an increase in student influence in the face-to-face classroom has been slow in coming due to the teacher-centered traditions of the brick and mortar schools. Online classrooms, however, have created uncertainty in pedagogical approaches and with uncertainty often comes a space for altering traditional approaches (Tushman & Nelson, 1990; Fullan, 2003). By moving classroom discussions into forum groups, students gain more voice and influence over the direction of the learning (Allen, 2005; Fischer, 2009, Xie & Ke, 2011) and a greater sense of community through opportunities for, "sharing of ideas

with classmates, and assisting each other when using technologies (Owen & Moyle, 2008, p. 17).”

It may be argued that an online, asynchronous environment is not conducive to developing emotional connection and this may be the case in many current virtual programs, leading to difficulties in supporting Relatedness needs and in developing a sense of community. However, this is not a universal truism. Students can establish meaningful connections with their classmates and, furthermore, desire to do so (White, 1997; Barbour & Plough, 2009). If this potential is exploited, online discussion groups could enable students to share different perspectives and experiences (Price & Water, 2007). This is especially important in an international online class, as students are exposed to a broader range of classmates from different cultural perspectives and backgrounds and where physical distance between students could span thousands of miles (Barbour & Plough, 2009; Wicke, 2010).

In a community, individuals will also support and reinforce each other’s needs. Several studies have indicated that, when online discussions can be built to support course goals through interaction, reflection and mutual assistance, both achievement and motivation will improve (e.g. Engelbrecht, 2015; Bachman & Stewart, 2012; Wigfield, Cambria & Eccles, 2012; Harnett, St. George & Dron, 2014). Barbour and Plough (2009) found that online students would actually seek help from peers before their teachers, i.e. student-student interaction was the preferred method of reinforcing academic goals in an online setting. Furthermore, due to advances in information communication technology, student-student interactions within an online context does not have to be not limited to reinforcement of needs for achieving academic goals (i.e. supporting autonomous academic motivation) but also has the potential to reinforce general Relatedness needs such as emotional connection and well-being (Deci & Ryan, 2012; Wigfield, Cambria & Eccles, 2012).

IV. The Question of context

While the universality of the three basic needs holds a position of centrality in Self-determination theory, it also holds that the expression of these needs lays within an environment external to self. SDT posits a:

real-world dialectic between integration-oriented human beings and the nutriments provided, versus the obstacles posed, by the actual social contexts. This dialectic entails a proactive organism that is seeking to extend and integrate its own psychic elements and its relations to others, embedded in a social environment that can be supportive or antagonistic to those efforts (Ryan & Deci, 2000b, pp. 320-321).

SDT examines how people internalize cultural worldviews, satisfying or thwarting their needs since it is the needs themselves that, “specify the conditions under which most people can fully realize their human potentials (Deci & Ryan, 2000d, p. 263).” In other words, SDT focuses on how the goals and values set by cultures support or thwart the three basic needs. It is important to note the concept of culture indicated here is broad and would also include subcultures such as school or online classes and even different historical time periods in which humans have existed (Ryan & Deci, 2000b). This has been supported by work outside of SDT, for example in Chisholm (1998) who found that technology can support individual differences in culture to satisfy needs and by Guyan (2013) who looked at virtual learning environments as an opportunity to build experiences that support motivation.

Because SDT recognizes the impact of context on autonomous motivation, it was necessary to explicitly define the boundaries of the academic context of the online classes found within QSI Virtual School (QVS). The following section details QSI’s approach to learning and the most important literature that have been used to define it.

All schools within the Quality Schools International system, including QVS, adhere to the motto “Success for All”, adapted from Gray and Hymel’s 1992 *Successful Schooling for All*.

Building off of that, QSI’s main beliefs (<https://www.qsi.org/about-us/#History>) are that:

- Virtually all students can learn successfully;
- Success breeds success;
- It is up to the schools to create the conditions of success

In the outcomes based learning environment that QSI schools employ, teachers are responsible for developing lesson plans that scaffold learning objectives to reach a successful outcome. They group students accordingly so that when the students need correctives or enrichment, it is easier to address these needs. Teachers are encouraged to recognize and reward success as soon as they see it. To accomplish this, QSI encourages the use of both extrinsic and intrinsic motivational supports. Enrichment opportunities are supposedly built so that students can engage in activities that are intrinsically interesting to them after reaching mastery in the essential tasks. Each QSI school also allows the teachers to determine when mastery has been achieved and develop the incentives within the classroom that support engagement. (Gray & Hymel, 1992).

Definition of success within the traditional QSI school is especially centered around praise from the teacher as well as getting good grades. More autonomous forms of motivation are built within the system, including centering aspects of the learning process around intrinsic interest as well as some Relatedness supports. “Reinforcement and reward are the motivational incentives teachers can offer students. A teacher’s praise and encouragement, for example, can often have a very strong influence on students’ motivation for learning (Gusky, 1985, p. 99).” Moreover, the learning outcomes are clearly defined and published for the students and parents. Therefore, students are taking

partial control of their own education by tracking their progress and making self-corrections when they perceive it is needed. This goal-oriented, autonomous approach is one of the hallmarks of QSI.

QSI emphasizes formative assessment with a mastery approach that provides rich feedback from the teachers. When mastery is not demonstrated, “alterations are made within the strategy in order to accommodate (or adapt to) learner differences (Bloom, 1981, p. 126).” If a student does not achieve mastery the first time around, the teacher changes the instructional strategy so that the next assessment focuses on a different learning style. This leads to greater successes and strengthens student-teacher relationships (Gusky, 1985). Initially, extrinsic motivators are used to encourage success but with time, as students’ Competence is supported through ongoing successes, autonomous motivation to learn increases, and less emphasis is placed on non-autonomous methods (Bloom, 1981). According to Gusky (1985, p. 72), “there is little doubt that the experience of success is one of the most powerful of all motivational devices.” This approach supports all three basic needs but is heavily weighted toward Competence. Success breeds success is, at its heart, a Competence supportive philosophy. Furthermore, since no individual assessment is high stakes, student-teacher academic interactions take place in a non-threatening manner and lead to greater perceptions of Relatedness. Finally, student Autonomy is supported in selective units where they are able to pursue areas of study that are interesting to them. In other words, they are able to, “self-organize experience and behavior and to have activity be concordant with one’s sense of self (Deci & Ryan, 2000d, p. 231).” According to Gusky (1985) these selective units should motivate students to do well on the initial attempts in order to continue to work on the projects that are inherently interesting to them.

Expanded opportunity is also a key feature of QSI. Teachers are instructed to measure success and not the time it takes to reach success. Therefore, students can work toward mastery of learning objectives and not be limited to a timetable in order to achieve it. Critics of this approach note that students learn to game the system, reducing their efforts in formative assessments and even in initial summative assessments. While expanded opportunity allows for an increase in feelings of Competence and perhaps Autonomy, it reduces opportunities for greater Relatedness as students who do not demonstrate mastery in the initial attempts are forced to work independently with only teacher feedback on the work.

Supports for student-student Relatedness are not heavily emphasized within QSI but its placement philosophy does lend itself to some support for Relatedness. In all QSI schools, students are placed according to ability in Reading, Writing and Mathematics. However, in all other subjects, students are placed according to their peer group. Therefore, a gifted sixth grade student may be placed in a high school Algebra course, Literature 1 and Writing 1- all high school courses. For the remaining courses, s/he would still be in courses with his/her peer group. While this is not particularly relevant to QVS courses (as they are all high school courses and therefore, not bound to a peer group), this makes establishing Relatedness supports for QSI online courses even more important given the possible feelings of isolation from peers in the home community.

V. Key Definitions

The following section lists key terms used in this study in order to explicitly explain their meaning to the reader. The definitions listed below are based on the literature review but reflect my own understanding of them.

- **Motivation:** The process whereby goal-directed activities are energized, directed and sustained (Xie & Ke, 2011; Shrunk & Usher, 2012).
- **Intrinsic Motivation:** behavior that is based on internal rewards, e.g. personal interests, curiosity, and/ or internal values (Harlow, 1953; White, 1959; Ryan & Deci, 1985).
- **Extrinsic Motivation:** behavior that is based on external rewards or punishments, e.g. grades, evaluations, or perceived opinions of others (Ryan & Deci, 2000c; Roca & Gagne, 2008).
- **Needs:** The psychological nutrients necessary for motivation and well-being. Self-determination theory has identified three needs as innate in all human beings: Autonomy, Competence and Relatedness. SDT holds that all three needs are necessary to each individual and will result in distinctive functional costs if thwarted (Deci & Ryan, 1985; Ryan & Deci, 2000a; Ryan & Deci, 2000b).
- **Well-being:** the state whereby individuals are energized toward growing, mastering challenges and integrating new experiences into an internal sense of self (Deci & Ryan, 2000; Ryan & Deci, 2000a, Ryan & Deci, 2000b; Zepke, Leach & Butler, 2009).
- **Competence:** the need to feel successful in one's interactions with the external environment when mastering appropriately challenging tasks (Deci & Ryan, 1985, Bachman & Stewart, 2007; Katz & Assor, 2007).

- **Autonomy:** the desire to self-organize behavior and feel that these actions are consistent with internal values, goals and desires, whether they are consciously understood or not (Deci & Ryan, 2000; Ryan & Deci, 2006; Katz & Assor, 2007; Harnett, St. George & Dron, 2014).
- **Relatedness:** the feeling of being connected to others who matter to them, caring for and being cared for by others and the belief that one's needs will be met through their interactions with others close to them (McMillan & Chavis, 1986; Ryan & Deci, 2002).
- **Membership:** the feeling and sharing of a personal closeness to others within a community (McMillan & Chavis, 1986; Rovai, Wighting & Lucking, 2004; Delahunty, Verenikina & Jones, 2014).
- **Influence:** the feeling of a sense of purpose, that one's decisions and actions in the community matter (McMillan & Chavis, 1986; Mitra, 2001).
- **Emotional Connection:** the belief that members have similar experience and history (McMillan & Chavis, 1986, Barbour & Plough, 2009).
- **Integration and Reinforcement of Needs:** the feeling that one's needs are met by being a part of the community (McMillan & Chavis, 1986).
- **Regulation:** the degree to which a behavior is motivated by an internal locus or external locus of control (Roca & Gagne, 2008; Deci & Ryan, 2012).
- **Autonomous Motivation:** a more highly energized form of motivation that derives from undertaking behavior that is useful, aligned with one's deeply held values or is interesting and enjoyable in and of itself (Bachman & Stewart, 2011; Harnett, St. George & Dron, 2011; Deci & Ryan, 2012).

- **Controlled Motivation:** a less energized form of motivation that derives from feelings of guilt or obligation or to achieve rewards and/or avoid punishments (Bachman & Stewart, 2011; Harnett, St. George & Dron, 2011; Deci & Ryan, 2012).
- **Amotivation:** a condition whereby the individual is not energized to undertake a behavior (Ryan & Deci, 2000a).
- **External Regulation:** undertaking a behavior to avoid punishment or receive rewards (Ryan & Deci, 2000a, Ryan & Deci, 2000c).
- **Introjected Regulation:** undertaking a behavior based on internal feelings of guilt or obligation (Ryan & Deci, 2000a; Ryan & Deci, 2000c; Assor, Roth & Deci, 2004; Vansteenkiste, Lens & Deci, 2006; Chen, 2007) .
- **Identified Regulation:** undertaking a behavior that is aligned with one's defined goals (Ryan & Deci, 2000a; Chen, 2007; Liu et al., 2009; Deci & Ryan, 2012).
- **Integrated Regulation:** undertaking a behavior that is congruent with one's internal sense of self but for an outcome that is external to self (Ryan & Deci, 2000a; Deci & Ryan, 2012).
- **Internalization:** the natural tendency to assimilate extrinsic motivations into one's sense of self so that they become congruent with personally endorsed values.

Internalization is optimized when the needs of Autonomy, Competence and Relatedness are supported (Deci & Ryan, 2000; Ryan & Deci, 2000a; Ryan & Deci, 2000b; Ryan & Deci, 2000c; Hadre, et al., 2006; Vansteenkiste, Lens & Deci, 2006; Rigby & Przyblski, 2009; Deci & Ryan, 2012).
- **Goal-Oriented:** the belief that undertaking a behavior is aligned with one's identified goals (Davis, et al., 1986; Venkatesh, et al., 2003).

- **Effort Expectancy/ Ease of Use:** the belief in technology acceptance models that the easier it is to master a new technology, the greater the positive impact on behavioral intention (Davis, et al., 1986; Venkatesh, et al., 2003).
- **Subjective Norm:** undertaking a behavior based on the belief that people important to yourself think the behavior is important (Davis, et al., 1986; Venkatesh, et al., 2003; Guay, Marsh & Senecal, 2008).
- **Performance Expectancy:** the belief in technology acceptance models that the greater the task value of the new technology, the more positive the impact on behavioral intention (Davis, et al., 1986; Venkatesh, et al., 2003).
- **Behavioral Intention:** one's readiness or desire to undertake a behavior. In technology acceptance models, a greater behavioral intention is assumed to lead to greater actual use of the technology in question (Ajzen, 1991; Davis, et al., 1986; Venkatesh, et al., 2003).

VI. Summary

Online classes are often characterized by high levels of isolation, which leads to higher dropout rates than face-to-face classes. It is therefore necessary to better understand the possible Relatedness supports of online systems. Otherwise, online learning will never reach its potential. Technology acceptance models are, by definition, concerned about acceptance and use of new technologies. However, technology acceptance models have been plagued by low correlation to behavioral intention to accept and use the identified technology. A very plausible explanation for this is that technology acceptance models, although concerned with constructs that energize behavior, are typically not grounded in motivational theories. Self-determination theory is a meta-theory of human well-being and

motivation and has been widely used in the field of education. However, there have been limited attempts to apply it to technology acceptance.

One of the largest failures in the application of SDT has been in the need of Relatedness and this need speaks directly to the perception of isolation and a lack of connection that, “is felt by students across culturally and linguistically diverse online environments (Delahunty, Verenikina, & Jones, 2004, p. 248).” Therefore, there is a need to further explore perceptions of Relatedness, at least in the online context. Psychological sense of community is another school of psychology that shares many of the attributes of Relatedness and could be used to more deeply articulate what Relatedness means and how it influences feelings of isolation. There are indications that by increasing quantity and quality of interactions within the online course sense of community could also increase, thereby supporting students’ Relatedness needs (Dawson, 2006). When quality student-teacher and student-student interaction is frequent in an online class, Relatedness and sense of community is high, leading to several positive implications, including increased persistence (Rice, 2006), retention (Tsai et al., 2008), course satisfaction (Swan, 2001) and more successful acceptance and use of the virtual learning medium (Li, Day, Lou & Coombs, 2004). If this is true, it is one possible way for instructional designers, teachers and educational leaders to develop guiding principles that support students as they seek to use virtual learning technology to reach their academic goals.

Chapter 3: Methodology

I. Introduction and aim of the study

The primary purpose of this Design-based research (DBR) study was to investigate the perceived impact of student-student interactions on behavioral intention of international high school students to use and persistence in online classes. This was a Design-based research study, primarily employing qualitative methods but triangulated by both qualitative and quantitative data. The goal of this study was to design, develop, implement and evaluate the effects of interventions to promote interaction within QVS courses (Deci & Ryan, 1985; McMillan & Chavis, 1986). As a Design-based study, the desired outcomes were to add to existing theory and also to produce artifacts that could be used in QSI Virtual School, in this case, a set of design principles to guide online course design and instruction. Ideally, the results of the study will be used to inform future research and lead to a deeper understanding of motivation in an online context. The research developed through several phases in an attempt to answer the following research question:

1. What are the effects of student-student interaction on motivation to engage in virtual learning?

Each phase of the Design-based research study involved an analysis of the results of the previous phases and a return to the literature to better explain the findings from a theoretical perspective. As in other approaches, e.g. Glasser and Strauss (1967), the study was not limited strictly to a predefined hypothesis or even a theory but focused on the lived experiences of the participants and attempted to ground their perceptions in theory. Through their narratives, the following secondary research questions also emerged as important.

2. What are the effects of teacher-student interaction on motivation to engage in virtual learning?
3. How do perceptions of Autonomy, Competence and Relatedness impact motivation to engage in virtual learning?

This section describes the research methodology, including details on Design-based Research, the Sense of Community Index, Participant Selection, Data Collection, Data Analysis, Ethical Considerations, and Limitations.

II. Design of the study

A. *Introduction: Design-based research*

According to Wang and Hannafin (2005 pp. 6-7) Design- based research is:

a flexible methodology aimed to improve educational practices through systemic, flexible, and iterative review, analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to design principles or theories.

Design-based research studies aim to “solve real problems while at the same time constructing design principles that can inform future decisions (Reeves 2000, p. 25).” Put another way, DBR focusses on the, “development of guiding principles along with the opportunity to make links between classroom practice and learning theories (Mantei 2008, pp.131-132).” Indeed, this close relationship between research and design is the key characteristic found in most definitions of Design-based research (e.g. Wang & Hannafin 2005; Barab 2006). DBR is distinguished from other practice-based approaches such as Action Research by its systematic and iterative attention to attention to real-life situations as well as its dedication to articulating theory within a situated context. According to the Design-based Research Collective (2003, p. 6), it:

...goes beyond merely designing and testing particular interventions. Interventions embody specific theoretical claims about teaching and learning, and reflect a commitment to understanding the relationships among theory, designed artifacts, and practice. At the same time, research on specific interventions can contribute to theories of learning and teaching.

B. Characteristics of Design-based research

Since Design-based research does not have a single accepted definition, scholars often rely on descriptions of its characteristics in studies using this approach. Wang and Hannafin (2005, p. 12), supported by other scholars, describe Design-based research as a process that “guides theory development, improves instructional design, extends the application of results, and identifies new design possibilities (Cobb et al., 2003; Edelson, 2002; Gustafson, 2002; Reigeluth & Frick, 1999).”

Two of the most fundamental characteristics of Design-based research studies are its iterative approach and a close connection between theory and practice. Wang and Hannafin (2004) listed five common themes found amongst studies employing a Design-based research approach. I have built off of these, as well as characteristics identified by the Design-based Research Collective (2005), to develop the following guidelines for this study. This Design-based research study is:

1. Situated in a context;

Building lasting design principles requires an in depth understanding of the workings of the innovation in context so that further researchers can apply them to other contexts (Design-based Research Collective, 2003; Penuel et al., 2011). Cobb, et al. (2003, p. 10) see this focus on context as crucial to developing a usable theory:

Theories developed during the process of experiment are humble not merely in the sense that they are concerned with domain-specific learning processes, but also because they are accountable to the activity of design. The theory must do real work. General philosophical orientations to educational matters-such as constructivism-are

important to educational practice, but they often fail to provide detailed guidance in organizing instruction.

This is supported by Wang and Hannafin (2005, p. 9):

...by embedding research within practical activities, the design processes themselves are studied. The resulting principles are perceived as having greater external validity than those developed in laboratory settings (Greeno et al., 1996) and as better informing long-term and systemic issues in education (Bell, Hoadley, & Linn, 2004). Thus, the design process is embedded in, and studied through, Design-based research.

2. *Demonstrative of a strong relationship between theory and practice;*

Design-based research aims to develop underlying theories while solving practical problems (Wang & Hannafin, 2005; Penuel et al., 2011). This DBR approach is perhaps more appropriate than other purely theoretical approaches given the dynamic complexity of institutional ecologies (Fullan, 1993; Penuel et al., 2011).

Since one of the end-goals of a Design-based research study is to improve practice, it is important that the end product be scalable, i.e. the derivation of the design principles should be transparent so as to allow future researchers to determine whether they may be valuable in other contexts. Van der Akker (1999) believes that scaling the research findings to other contexts will provide the opportunity to test for generalizability and greater validity. Furthermore, I recognize that to be truly valuable to the practical solution, design and learning theories must be applied to the context (see above). Through this focus on situated theory, it is possible to articulate the why's and how's of the design elements and use them to guide further analysis and research. Without a reliance on theory, the design could be successful in the local/ immediate context (i.e. through a simply trial and error process) but would most likely fail in the secondary goal of adding to existing knowledge in order to improve broader design innovation (Wang & Hannafin, 2005).

3. *A dynamic, iterative, flexible, and on-going process;*

Unlike traditional research, the DBR process is dynamic, whereby analysis is conducted simultaneously with data collection (at least on some levels). Changes to the designs take place in an iterative process through formative evaluation and feedback from the research participants (Design-based Research Collective, 2001; Wang & Hannafin, 2005). Flexibility is key as new data becomes emergent and the understanding of the phenomenon is deepened (O'Donnel, 2004).

4. *A partnership between researchers, teachers and students;*

This study accepts the opinions and perceptions of all participants as valid. While this is not necessarily true of all DBR studies, many do involve the participants in theory creation.

All participants are immersed in the setting and work as collaborators or co-constructors of the design. To ensure the feasibility of the initial plan and improve the design en route, designers consult with teachers and students, remaining mindful of their theory generating goals as they balance the theoretical and practical. Thus, they neither adopt their clients' values nor impose their own, acting instead as facilitators and adapting to their clients' perspectives, beliefs, and strategies while aligning and extending the design processes (Wang & Hannafin, 2005, p. 17).

Greater involvement of stakeholders in describing the results of the innovation within their classroom context makes for a richer understanding of the findings since they are the ones living the experience (Mitra, 2001; Sivlas, 2001) and can help create tools and define theories that bring about meaningful change (Design-based Research Collective, 2001; Penuel, et al., 2011). It could be argued that, due to the complex and dynamic relationship between context and theory, it is impossible to understand theory in the context without investigating and, perhaps involving, the stakeholders (van der Akker, 1999; Wang & Hannafin, 2005). Furthermore, it is the "extending the design process" that often leads the researcher to develop secondary research questions based upon the involvement of the participants- just as it did in this study.

5. *Independent of specific data collection and analysis methods.*

DBR does not follow any given methodology in terms of data collection or analysis. Many DBR studies follow a quantitative approach but both qualitative and mixed methods are evident in the literature (Hall, 2009). DBR approaches do not seek to replace other approaches but to integrate them within the study.

A. *The Design-based Research Process*

Design-based research differs from empirical studies undertaken with empirical goals. It emphasizes developmental goals and an iterative approach. Reeves' model (2000, p. 9) is still the basis for many of DBR studies today. This three phase model illustrates the iterative nature of DBR with separate formative and summative stages:

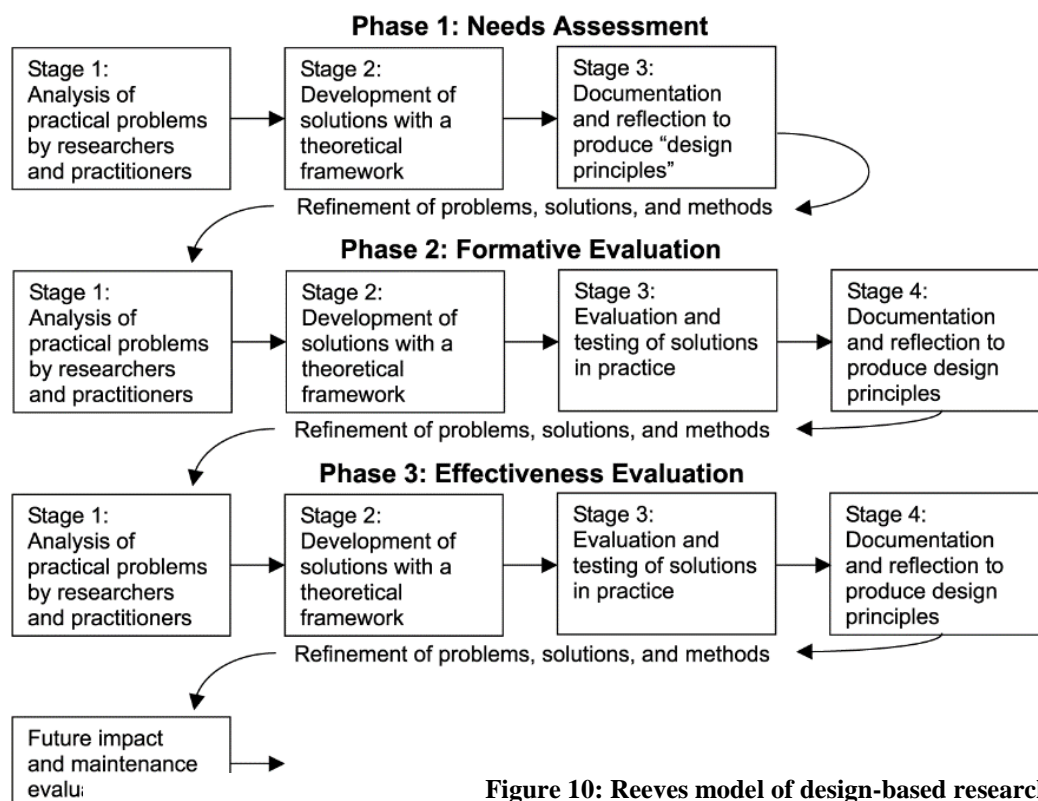


Figure 10: Reeves model of design-based research

Bannan-Ritland (2003) also developed a model called the integrative learning design framework, exhibiting all of the characteristics of DBR studies listed above:

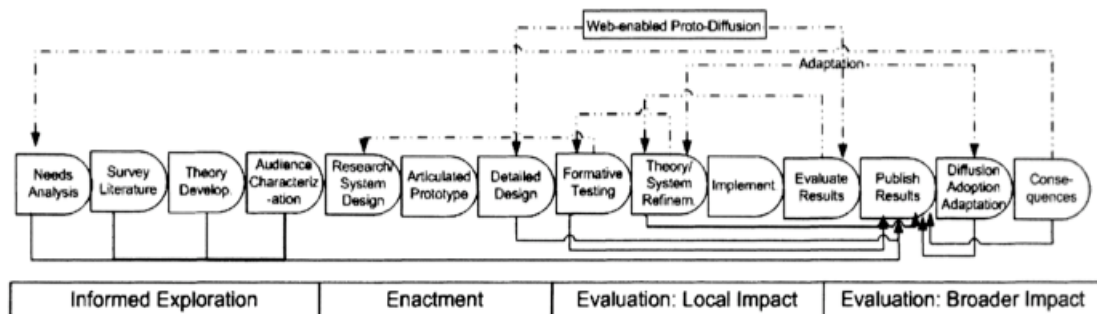


Figure 11: Bannan-Ritland's Integrative Learning Design (2003, p. 22)

This study builds off of the ILD, the Reeves model and the characteristics of Design-based research listed above. It includes four phases: needs assessment, creation of a design solution (enactment), iterative testing (formative evaluations) and a summative evaluation of the broader impact. The first iteration in Phase three took place in a pilot research enquiry for the University of Bath (Snyder, 2014), followed by two more iterations that explored subtle differences in the design principles.

1. First Phase: Needs Analysis

As indicated in the design above, a needs analysis took place after each iteration of the process as the effectiveness of the draft principles was examined. The initial needs analysis began in a series of professional development conferences hosted by Quality Schools International entitled, “Effective Strategies for Using Virtual Learning Environments.” Conferences were held in Armenia, Azerbaijan, Georgia, Macedonia, Malta, Montenegro, Slovakia, Slovenia, Thailand, Ukraine, and in the United States from 2010-2011. Over three hundred teachers and administrators participated in the conferences over the course of the two years and helped identify specific needs for the program based

on their interaction with the virtual learning environment, a brief literature review of best practices and their knowledge of their students.

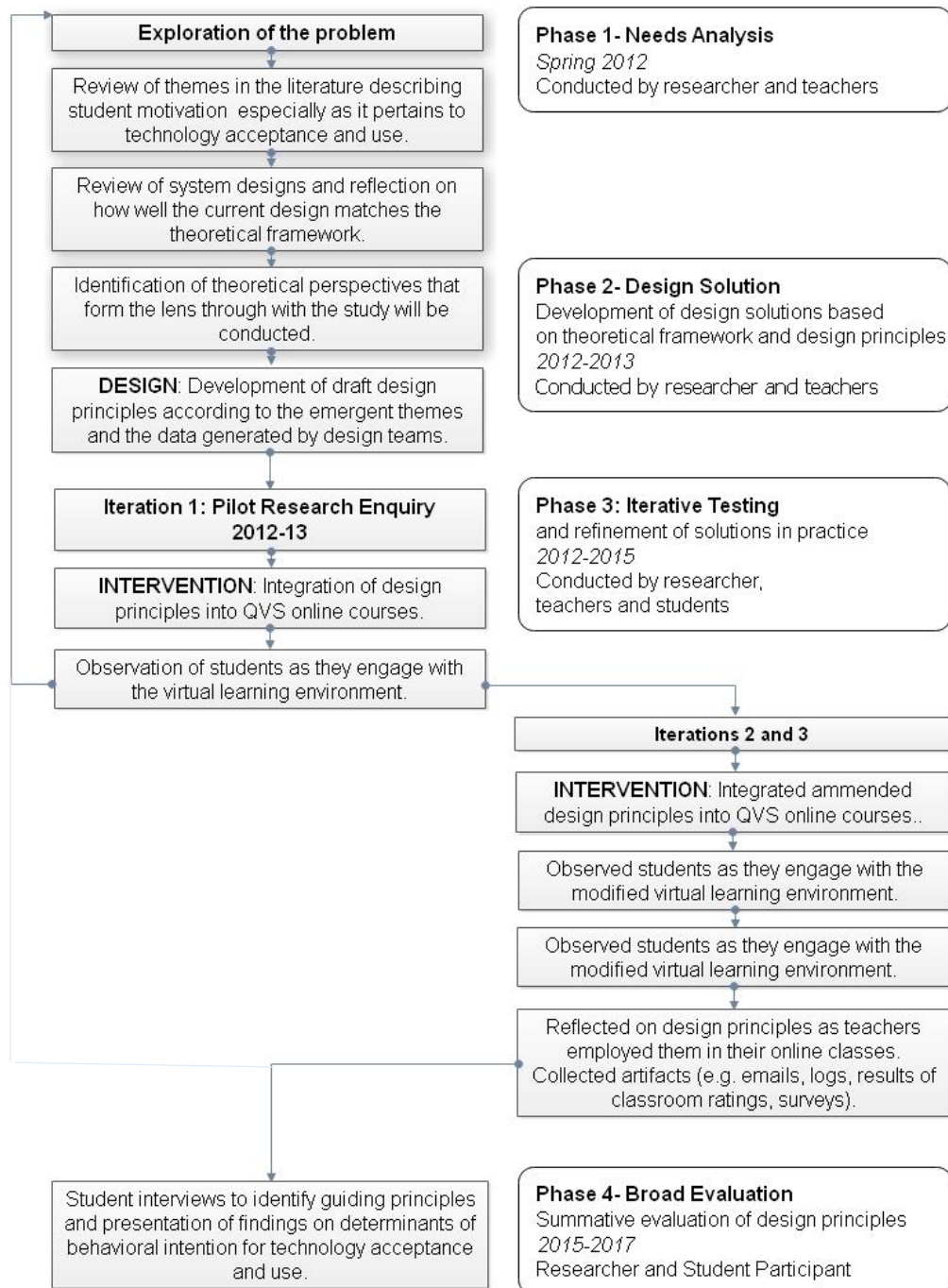


Figure 12: Design of the study

Building off of their participation in the professional development conferences, a formal needs analysis took place during the spring of 2012 as a part of a graduate level course from the State University of New York, Buffalo State College. After it was decided to found QSI Virtual School, QSI Headquarters authorized me to contact directors of interested teachers to ensure that they could be given time in their schedules to teach online. Headquarters paid the cost of tuition for all teachers who would teach in QVS. This course was entitled, “EDC 603: Instructional Design and Problem Solving with Technology” and was taught alongside teachers in a Master’s degree cohort hosted dually by QSI and SUNY, Buffalo State. Following the QSI approach to learning, the course was broken down into four essential units and one selective unit of student choice. The units were centered around discussions of best practices for engagement, instructional techniques and assessment in online instruction within a mastery learning context (See Appendix A). While participation in the graduate course (and teaching online) was voluntary, it was required for all teachers who volunteered to teach online with QVS. Nine teachers were initially selected to teach online.

After reviewing their reflections from the professional development conferences, the initial exploration of the problem, i.e. how to motivate students in an online course, the teachers conducted a guided analysis of prior studies (Sundarayev, 2010) by undertaking a survey of the literature. This served to identify the overarching research perspectives involved in online instructional design. This initial survey of the literature included both research on virtual learning design, theories of technology acceptance and use, motivation theories, general theories of learning, and best practices for virtual learning.

This study followed the Ethical Guidelines for Educational Research developed by the British Educational Research Association for obtaining voluntary informed consent, for obtaining guardianship approval of said consent, and for all remaining ethical concerns for

this research (BERA, 2011). Teachers participated in the class on a voluntary basis and gave consent for the process to be used in studies for the University of Bath and Quality Schools International.

2. Second Phase: Design Solution

As in phase one, phase two took place in several iterations as the study progressed since DBR studies return to earlier phases to guide interventions in the iterations. As a result, a review of the relevant literature continued throughout the study and into the preliminary review of this paper in order to identify gaps in the literature and stay current with the research as applicable to the emergent findings (Cobb et al., 2003).

The final project for QVS teachers in EDC 603 was to develop a set of draft design principles for QSI Virtual School in order to guide the first round of course design. This was primarily a task for the nine individuals selected to teach online classes in QVS although both the needs analysis and creation of draft design principles was assisted by 12 other teachers taking the class for professional development credit or as the first class in their Master's program. The first set of draft design principles included recommendations for:

- Transparency
- Chunking
- Interactivity
- Flexibility
- Student Centered
- Ease of Use

Five of the nine teachers remained in the program after the first year and participated in a second professional development conference in Malta to revisit the design principles. It

was agreed that the draft design principles were an incomplete solution, failing to meet the specific needs of QVS students. It was during this conference that the Big Idea project was proposed and developed for implementation in iterations two and three of Phase three with a new draft design aimed at increasing engagement within all QSI courses.

This phase followed the BERA recommendations for ethical research. Volunteer teachers evaluated this initial design solution during their first online classes and found that they did not meet the objectives of the program. Students did not participate formally in the study at this point but data anecdotal information from teachers did form a key element of the discussions around the design solution. Teachers were volunteer participants and, while the results of their work were accessible through district policy, consent was sought and given to include their findings within this study.

3. Third Phase: Iterative Testing

The first iteration took place during SY 2012-13 and was investigated as a part of a Pilot Research Enquiry (Snyder, 2014). Following the analysis of the data, online teachers met in the summer of 2013 and developed the Big Idea Project in order to address the needs that were not met with the implementation of the design principles in the first iteration. These design principles were tested over the course of several, similar Big Idea projects during SY2013-14 and SY2014-15 in both the second and third iterations of the study. Ongoing data was input into the NVivo11 qualitative data analysis package for coding and analysis.

Phase three of this Design-based research study involved collection of data from discussions, informal interviews, teacher observations and statistical data from the virtual learning environment. Discussions in online forums helped to inform the researcher of the success of the draft design principles. Iterations of data collection and analysis aided in assessing the strengths of the design principles and in modifying them accordingly.

It was during this phase that ethical considerations became more of a concern as it saw the direct involvement of minors. BERA guidelines were followed in order to address any ethical concerns. During the first iteration in the formative evaluation phase (the pilot research enquiry), all online students were asked to complete an anonymous survey focusing on their experiences in the classes. Although specifically allowed in the school's acceptable use policy, both students and their parents or guardians signed an agreement granting permission to use the anonymous data for research and development purposes. Permission to undertake the study was also given by the Director of Operations for Quality Schools International (QSI) and the Director of QSI Virtual School. During subsequent iterations, students were also invited to participate in Critical Incident Surveys. All CIS were anonymous and participation fell within the acceptable use policies of QSI. No student data was kept but, anecdotal data from teachers remained a key element in discussions leading to the formation, modification and early analysis of Big Idea project iterations.

a) Iteration 1

Following the conclusion of online courses in SY2012-13 all QVS students were invited to participate in a survey of their online course experiences based on the draft design principles developed in the Spring 2012 course described above. The survey was distributed in SurveyMonkey (www.surveymonkey.com). All online students, regardless of the provider of the courses, were invited to participate. This drew from a potential pool of 111 students across QSI.

The participants were asked to anonymously answer a series of questions on a 1-4 scale where 1=Strongly Disagree, 2=Disagree, 3=Agree, and 4=Strongly Agree. A neutral category was not included in order to elicit a positive or negative response and because, as

Kwok (2012) noted, the use of a mid-point could potentially harm measurement validity if respondents believe it to be the most socially acceptable answer.

The design principles in the first iteration were based heavily on the original UTAUT research model (Vankatesh, 2003) with four constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. Attitude toward using technology was also included. Although attitude was discarded as a significant intermediary in the UTAUT model, it was reintroduced due to its heavy support in other models, e.g. the Technology Acceptance Model and the Theory of Planned Behavior. The QSI faculty also felt that teacher-student interactions and student-student interactions could play an important role in behavioral intention and these were included as well. Open ended questions were also used in order to identify possible new constructs influencing the model. During the Pilot Research Enquiry students voluntarily elected to participate in the surveys. No identifying personal data was collected but basic demographic data was included.

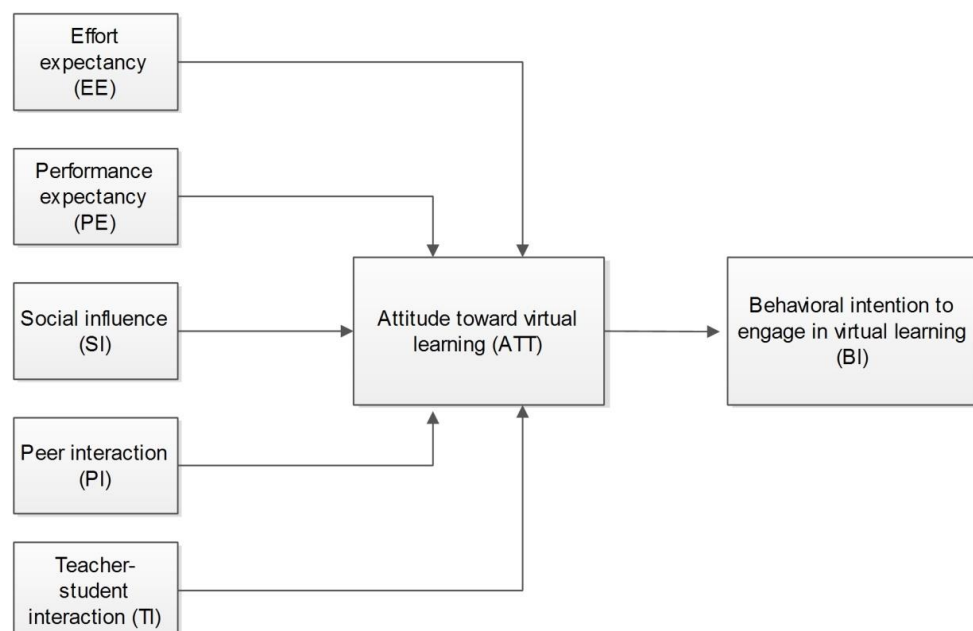


Figure 13: Social UTAUT (Snyder, 2014)

b) Iteration 2

Throughout the second iteration, teachers kept a critical incident survey (Flanagan, 1954) link on all of their class pages. All students were encouraged to submit a critical incident whenever something happened in the class that was out of the ordinary and impacted their motivation to learn. Throughout the year, teachers sorted through the data and brought their findings, as well as anecdotal narratives to the 2013 QSI Summer Institute in Malta. A total of 62 incident tickets were created. At the conclusion of the institute, a new set of design principles were developed, which included a supplemental course called the Big Idea Project.

The second iteration was conducted during SY2013-14 and SY2014-15. During this time, usage data and posts from the online forums were imported into NVivo11 for data analysis by the researcher.

c) Iteration 3

During the Summer Institute in 2014, some teachers, particularly in the Math and Sciences, questioned the necessity of student-student interaction based on their interactions within the courses. Therefore, the final Big Idea project of SY2014-15 was modelled after the QSI research project in which students interact solely with their teachers (<http://curriculumfiles.qsi.org/SECONDARY/SEC%20%20ENGLISH/RESEARCH%20PROJECT%2014/>). The concluding project was an academic paper presented to their local community and streamed worldwide for all interested parties (family and friends in their home countries, other QSI schools and their QVS teachers). So while teacher-student interactions formed the basis of the interactions within the third iteration, some elements of student-student interactions (e.g. subjective norm) may have had importance as well. As the third iteration was the last iteration within the series, all analysis of effectiveness within it took place during the broad evaluation phase.

4. Fourth Phase: Broad Evaluation

This phase of the project centered around a formal, summative evaluation of the primary research question. Interviews were primarily used to gather data (see below) and included questions around all three design principles used in the online instruction. The results section of this paper centers largely on the findings of phase 4. This data was added to the archived materials and analyzed within the NVivo11 software package. This led to a deeper understanding of the theoretical basis and a critical evaluation of the design principles surrounding student motivation to accept and continue to use virtual learning environments to meet learning objectives (Matei, 2008).

a) Sample Selection

In Phase 4, a general inquiry to all students in QVS was sent out in order to determine interest. I then contacted directors of the different schools offering online classes to determine which of the students would be most likely to be able to “provide full descriptions of their lived experiences (Moustakas, 2013, p. 114).” Ability to commit to the interviews, the fullness of their schedules were discussed. A purposive sampling (Etikan, Musa & Alkassim, 2016) technique was then employed to ensure that students from small (0-50 students), medium (51-200 students) and large (200+students) schools were represented in order to gauge the impact of Relatedness in students with varying degrees of access to peers in their home communities. In the end, seven participants were selected, representing a mix of school size as well as other demographic information. This number was deemed satisfactory as it represented the required range of school sizes and roughly 10% of the QVS student body. For a more detailed breakdown of the demographic information of the participants, please see Chapter 4.

Gender	Nationality	Location	Size of Home School
Male	USA	South America	Small
Female	Indian	Central Asia	Medium
Male	Ukrainian	Eastern Europe	Large
Male	Russian	Central Asia	Medium
Female	USA	Asia	Medium
Male	Argentine	Southern Europe	Small
Female	Turkman	Eastern Europe	Large

Figure 14: Summary of demographic information

During this phase, the participants and I also looked at earlier iterations to assess whether or not their design principles could be applied to other contexts. The findings were then shared with the leadership of QSI and QVS in order to be used throughout the organization. This phase added the challenge of setting the design principles within the context but also to phrase them broadly enough to allow for wider diffusion. (Wang & Hannafin, 2005). An additional challenge of researcher as participant was identified, which could cause some challenges to the validity of the results:

The role of the [design based researcher] as a context manipulator may actually undermine the credibility of the claims being made. Therefore, in addition to the challenge of working in complex situations, [researchers] have the challenge of justifying their claims as usefully informing other contexts of participation even

though at some level these researchers are responsible for producing the very claims on which they are reporting (Confrey, 2006, p. 12).

Phase 4 was characterized by a series of three interviews aimed at:

1. establishing the personal experiences of the participant through an exploration of their life history in relation to the research question;
2. Elaborating on the current lived experiences of the participant as relates to the research question and;
3. Reflecting on the meaning that the participant gives to the meanings of these experiences.

All data was archived and imported into NVivo11 for data analysis and revision of design principles and the subsequent Big Idea project. Prior to beginning interviews in the summative review phase, ethics approval was sought from the University of Bath in order to ensure the safety of the participants involved in the study. This was especially important given that the main participants were underage high school students taking online classes through QVS.

As I was no longer affiliated with either QSI or QSI Virtual School at the time of the interviews, there should have been a lessor chance of issues related to power beyond the adult-child relationship. The possibility of power issues due to age was something that I remained mindful of during the interviews and attempted to alleviate as much as possible by focusing the discussion on the importance of their perceptions. While nothing was ever promised in terms of grades or extra credit, it could have been possible that students felt they would receive an advantage if they participated. In order to address this, I repeatedly stressed that participation was voluntary and that students had the ability to opt out at any point.

Once students expressed their interest to participate, they were reminded of their privacy rights under QSI policies and were further asked to speak to their parents about the research. Both students and parents were required to sign an agreement in order to participate. Due to the voluntary nature of the study and by informing parents only after initial interest was established, it is hoped that feelings of obligation to become involved in the study were lessened.

Many of the students were in their last years of high school and I recognized that this could have put a strain on their already busy schedule. Therefore, I worked exclusively around the students' time demands and rescheduled several times to meet their needs. To respect their time and to reward participation, the curriculum coordinator awarded one selective credit in technology to each participant.

In order to protect confidentiality, several measures were taken. All survey interactions took place behind a password protected area of the virtual learning environment and raw data for analysis was stored on my password protected laptop. Interviews took place via Skype and I was always in a quiet, private space. The names of the participants have been changed in the results section to protect their identities and their locations were limited to the general geographical region instead of the specific location. Furthermore, by allowing students to have an active voice in the design process, it was hoped that the design principles would be more authentic to other students.

b) Structure of the Interviews: Three Interview Series

As DBR does not identify a method for data collection (see Characteristics above), it was important to choose a method that best suited the research question. Conflicting results with quantitative tools led me to believe the constructs found in technology acceptance models were possibly inaccurate or at least incomplete and a qualitative method was deemed

as more appropriate in order to create a space for critical reflection (Galletta & Cross, 2013, Ch. 3). I chose a series of three semi-structured interviews in order to generate rich data on pre-existing technology acceptance constructs, particularly as understood within the context of Self-determination theory, and to allow for the possibility of identifying new constructs impacting motivation in virtual learning environments. These interviews allowed for the “exploration of lived experiences as narrated in the interview in relation to theoretical variables of interest (Ibid, Ch. 1).” By situating the reconstruction of their experiences within the context of their daily lives, the results transcended individual agency, telling the story of the online experience in deeper and wider detail.

Prior to the actual interviews, a series of standard questions were developed in order to create a better flow within the structure of the interview. However, while this semi-structured approach continually reminded the participants and the researcher of the variables being studied, the participants still had opportunities to diverge from the prepared questions and the researcher was able to build off of answers, seeking greater elaboration of responses or to, “listen actively and to move the interview forward as much as possible by building on what the participant has begun to share (Seidman, 2013, p, 84).”

Each participant was interviewed three times for approximately one hour each. The individual interviews focused on a specific learning context. Following each interview, notes were taken, listing core ideas and questions for follow-up interviews. During the period between interviews, comments were compared with one another, making the process both cumulative and iterative. This looping and checking of beliefs enhanced the validity of the comments made by the participants. Furthermore, by scheduling the interviews over several weeks, the interviewer and the participant both had the time to reflect deeply on the meaning of their responses. It also allowed the researcher time to review interview notes and

recordings as well as appropriate literature in order to prepare follow up questions to earlier responses.

An interviewing guide was used to help the participants reconstruct their experiences. The interviewing guide contained several types of initial, theory-driven questions, included open-ended questions to identify possible new, relevant constructs. It also built off of earlier responses to shape the ongoing narrative. Thus, the interviews generated data that were true to both the personal experiences of the participants and also to the theories in which the study was grounded. The interviewing guide was flexible to the experiences of the participants as they unfolded but included:

1. Open-ended feedback following the Sense of Community Index (See Appendix B).
Participants were asked to gauge how closely they agreed with the Sense of Community statements and to give examples to support their beliefs. This was used to explore their experiences in online classes, face to face classes (first interview) and during the Big Idea project (second interview).
2. Personal reflections in which participants reconstructed their online experiences and the face to face interactions happening around them that may have impacted their behavioral intention to engage in their online studies. For samples see Appendix C:
3. Personal reflections on their subjective experiences in their online classes. These types of questions were most often used in the third interview session in order to focus on the attitudes and motivational determinants. For samples questions, see Appendix C.
4. Non-scripted opportunities to add important items to the discussion that may have been overlooked. Through this open-ended process, new constructs could be investigated.

5. A summary of the theories being investigated. This was usually reserved for the final interview and involved the researcher describing the theories being studied and discussing their implications with the participants as applicable to their personal experiences. This is in line with the “participant as co-researcher” model and forced participants to reflect on personal meanings uncovered in the interview series and how they might fit into the theories.

The three interviews each had specific goals associated with them as described below and care was given to keep the participant focused on the particular context of the interviews since one interview established the context for the next. Additionally, freedom was given to the participants to narrate their experiences but, when off topic, they were continually guided back in order to convey an account of their lives as they related to the research question. Throughout the interviews, care was given to listen carefully to the unfolding narrative for areas in need of clarification or greater meaning making and to note comments for later reflection of deeper meaning. This required a great deal of reflexivity on my part, i.e. examining my personal impact on the research process and design. No unsolicited mention of theory was initiated in the first two interviews. However, it should be noted that theory was embedded in the questions throughout.

c) Interview #1: Focused Life History

The first interview began with dialogue aimed at putting the research participants at ease, including a description of the process and goals of the study. The initial conversation also included a discussion of their rights as volunteers and an expression of gratitude for their time. This took between five-ten minutes and was meant to put the participant at ease and make them comfortable throughout their participation.

The first interview focused on motivating experiences in online and face to face classes, paying closest attention to how Relatedness impacted their engagement. This interview created space for the participant to provide responses grounded in the experiences they felt as relevant to the topic. For instance, one participant chose to describe how interactions impacted his motivation while he was in elementary school. This interview was the most open-ended of all the interviews. It formed the central story of the participants' experiences and was particularly important in that each experience was impacted not only by individual agency but also by the context and structures in which it was situated. The first interview impacted the direction of subsequent interviews as those became grounded in the participants' narratives as detailed during this interview (Galletta & Cross, 2013; Seidman, 2013).

d) Interview #2: Details of the Experience

The second interview built upon what was learned in the first interview and focused on the concrete details of the experience being studied. This interview avoided asking for opinions but focused on the concrete details that could be used to form opinions. It also looped back to details brought up in the first interview in order to connect it to specific points that were pertinent to the research question. In this case, the second interview focused on the Big Idea project, paying close attention to the primary research question but leaving enough space to allow the participants to indicate other areas that might impact their motivation.

e) Interview #3: Reflection on Meaning

The final interview offered the opportunity to return to any unfinished business or unanswered questions in the first two interviews. It allowed me to probe deeper into specific topics that were brought up and approach them from a more theory-laden point of view. An overview of the theories involved in the study was presented to the students as background

for this interview. Participants were asked to reflect on what was discussed in the first two interviews and *make meaning* of them in the context of the research question. Theory was then discussed with the participants in the context of their experiences and we discussed how it related to them. They were also asked to comment on responses of other participants in an abstract and theoretical perspective as it applied to their experiences. For example, one participant stated, “Student-teacher interaction is important for learning and student-student interaction is important for fun.” Other participants were asked to comment about that from their experiences and for what they understood of Self-determination theory.

III. Data Analysis

The results section of this study includes an overview of Phases 1-3 of the Design-based study but focuses on summative evaluation in phase four. Each phase employed different data analysis methods. The results of the first iteration were analyzed in a quantitative approach. Modifications to the design principles for iterations two and the summative evaluation all employed a qualitative approach.

A. *First Iteration: Pilot Research Enquiry*

Three statistical methods were used in the first iteration:

1. Cronbach’s Alpha for survey reliability;
2. A correlation test to measure the strength and direction of the relationship between constructs;
3. A regression analysis to estimate the relationship of the constructs (independent variables) to behavioral intention and attitude (dependent variables).

The “correlate” and “regression” tests were conducted using the Data Analysis Toolpack of Microsoft Excel. Cronbach’s Alpha was conducted with the Resource Pack available from Real Statistics Using Excel (<http://www.real-statistics.com/reliability/cronbachs-alpha/>).

I employed a modified version of the Stevick-Collaizi-Keen (Creswell 1998) method to analyze the open-ended responses:

1. I identified *Significant statements* that were non-repetitive and non-overlapping.
2. I grouped the *significant statements* into *clusters of meaning* and visually represented them in word tables;
3. Finally, I wrote a narrative description of the *essence* of the *clusters of meaning* and included this in the results section of the pilot research enquiry report (Snyder 2014).

B. Second Iteration

During the summer of 2013, QVS teachers met in Malta and discussed the results of the pilot research enquiry. Teachers critically examined the recommendations made in the pilot research enquiry in conjunction with an analysis of current literature on best practices in online learning and adapted a set of guidelines for their online courses.

- Include automated assignments with instant, formative feedback;
- Tightly align instructional activities to instructional goals;
- Make directions clear and explicit;
- Limit the amount of information in each learning module to make it more accessible;
- Make lessons more interactive;
- Make assignments as fun as possible;

- Keep flexibility in the work load but provide a broad, time based structure for assignment completion, e.g. give unit deadlines but allow students to turn in work at any point within the unit;
- Include external motivators such as reward points for completed assignments;
- Give students options within assignments and/or optional assignments, e.g. students could be given a list of three things that they could do to prove mastery of a given unit outcome and must choose one of them;
- Encourage peer interaction, e.g. by offering student led Skype discussions;
- Develop a strong and personal teacher presence with prompt communication;
- Develop a relationship with a mentor teacher at the physical school;
- Give quick and meaningful feedback on assignments;
- Choose software and platforms that are stable to limit technical difficulties

As a part of these guidelines, and to address a generally agreed-upon need for student-student interaction, they also created the Big Idea Project. The Big Idea project is an interdisciplinary elective course aimed at providing students the chance to demonstrate A level mastery for two units in their disciplinary courses. It was patterned after a Group Four Project in the International Baccalaureate program at Kyiv International School, where three of the online teachers were working. The second iteration encompassed three individual Big Idea projects:

1. What is the nature of life?
2. How has industrialization changed people?
3. Will the future be utopic or dystopic?

The fourth, planned Big Idea project was cancelled due to time constraints. A level mastery was assessed internally in the remaining two units. During the three BI projects in the first

iteration, students had the continuous ability to log critical incident “tickets” aimed at identifying key strengths and weaknesses of the draft design.

C. Third Iteration

During the summer following the first iteration, the results of the critical incident surveys were investigated in an open forum during the at a QVS teachers’ retreat. Anecdotal data of student interactions were also discussed amongst teachers. While it was generally felt that the results of the Big Idea project were satisfying, Math and Science teachers in particular questioned the overarching need for student-student interactions. Minor modifications to the design principles in the Big Idea project were implemented during the third iteration to increase the presence of teachers in the project, specifically in Stage One when all of the students were interacting together from the various courses. Additionally, Big Idea #4 in year two was modelled after the QSI Research project. This Big Idea project was an independent research report and interaction was exclusively student-teacher in order to investigate the value of student-teacher interactions as opposed to student-student interactions.

D. Phase 4 (Broad Evaluation)

A thematic analysis using a modified version Moustakas’s (1994) structured method of inductive data analysis was used in this study. Moustakas drew heavily on the transcendental phenomenological reduction work of Stevick (1971), Colaizzi (1973) and Keen (1975), to develop a method that would draw out the meanings of a shared, lived experience of several individual and to describe the essence of that experience. Design-based research studies do not dictate any particular method for data analysis but one of my main reasons for choosing a thematic analysis in this study was to address gaps in the literature by

focusing on themes within the participants understanding (Fielden, Sillence & Little, 2011). I also sought to keep open the possibility that I would identify new constructs from the data sources, “producing new knowledge grounded in the research context (Galletta & Cross, 2013, Ch. 1)” instead of relying on pre-existing constructs in technology acceptance models or motivational research. It is worth noting that while this study uses tools and some terminology from phenomenological research, it is not meant to be a phenomenological study.

Data analysis in the summative phase began by transcribing each interview. I chose to use a transcription service in order to increase the speed of the transcriptions so that each interview could better build off of the previous. However, in order to more firmly immerse myself in the experiences of the participants, I transcribed one interview myself. This also allowed me to experience the tone of the interview and capture emotions that do not appear in text. For example, spontaneous laughter was noted in one interview and addressed in a follow up question. Memos were also used as notes to myself throughout the data collection and analysis process as a way of highlighting areas of interest or concern.

During the transcription phase, I also engaged in tutorials on how to undertake a textual analysis with NVivo11 including: NVivo11 for Windows (nine video series), several archived webinars on how to use NVivo11 and other webinars on how to analyze interviews. Following the initial transcriptions, I listened to each of the recordings of the interviews while reading the transcripts and then reread each of the transcripts to record memos and notes. After this initial immersion, I followed the steps below:

1. During the initial coding cycle, I used descriptive, open coding to the data whereby interesting features of the data were assigned a code or node as it is called in NVivo11. This initial process produced 62 codes but:

coding is a cyclical act. Rarely is the first cycle of coding data perfectly attempted. The second cycle (and possibly the third and fourth, and so on) of recoding further manages, filters, highlights, and focuses the salient features of the qualitative data record for generating categories, themes, and concepts, grasping meaning, and/or building theory (Saldaña, 2013, p. 8).

While I attempted to use an open coding approach, I was also heavily immersed in the literature at this point. Therefore, while many codes came directly from the words of the participants or their latent meaning, many others emerged that were directly related to theory. These selective codes were intertwined with theory and the concepts derived therein. For example, “facilitating conditions” was a code assigned when students were satisfied with the efforts of their teachers and/or the system in providing support for overcoming technical difficulties. This “code” came directly out of technology acceptance research.

In this stage, I employed a process called horizontalization, whereby I listed each horizon or statement relevant to the topic and coded those of interest in NVivo11 with a descriptive label. The goal was to consider each statement within the context of the research questions. Codes were not weighted at this stage of the analysis but were given equal value in order to be receptive to every statement of the participant’s experience (Moustakas, 1994). Memos were kept as well to indicate unclear meanings or undefined categories.

2. After the initial codes had been established, I reduced them, combining similar codes and eliminating codes that were overlapping, repetitive or vague. This entailed analyzing statements and codes to determine whether they contained a description of a moment that was necessary to understand the conscious experience as outlined in the research question. Seidman (2012, Ch.8) describes this as a process of, “exercising judgment about what is significant in the transcript...[beginning] to

analyze, interpret, and make meaning of it.” Moustakas (1994) adds the necessity of being able to abstract and label the statements as necessary in this step. He calls horizons that are necessary to understand the experience and are able to be abstracted and labeled, invariant constituents. Through this entire process, a smaller but stronger collection of codes developed. The frequency of the code was a definite consideration but “outliers” were also considered if the code reached a level of horizon. Conversely, some statements were particularly compelling but not relevant to the research questions. This study includes some of them as relevant to the participants but does not endeavor to fully integrate them into theory.

In keeping with the Facilitating Conditions example above, the following was listed as an invariant constituent under the code Facilitating Conditions and helped explain how Autonomy and appropriate design could be a Facilitating Condition:

If something is not working, I just move on to the different activity that I had to do. So, to me it doesn’t even matter...if just like one thing isn’t working then I’ll just move on to the next (Tammy).

3. The invariant constituents were then clustered into themes, moving the focus away from individual interviews to data across the interviews. Similar codes from different participants were included in the themes in order to support the invariant constituent. The tables below (See Results) include only a sample representation of the codes, reduced to avoid overlapping and repetitive statements within a participant’s narrative. Many more statements could have been added to each code but were rejected as too similar to others and, therefore, simply not necessary to understand the experience.

The process of identifying themes also included many steps. As I became more and more familiar with the invariant constituents, I reorganized the themes to better represent the participants’ experiences and developed subthemes to further

articulate the experiences represented. This was done by comparing the theme against the participants' complete transcripts to investigate whether they were either explicitly expressed in the transcripts or compatible to them. If they were not explicit or compatible, they were not deemed relevant to the participants' experiences and were either deleted or revised (Moustakas, 1994, pp. 120-121). In the example above, the code, "Facilitating Conditions," was combined with the code, "Autonomy," within the theme, "Autonomy, Competence and Relatedness Online" in order to describe a positive outcome of an autonomously supportive design.

At this point, I then reengaged with the literature to better understand the emergent themes. Through this, the research began to move into a more abstract phase full of "connecting threads and patterns among the excerpts (Seidman, 2013, p. 127.)" Care was taken to remain true to the narratives of the participants' experiences and not force statements into categories and themes that I already had in mind but to develop themes from their experiences. Using the Explore tools of NVivo11, Graphic representations of the codes and themes helped to visualize the importance of different themes and their relationships to the participants.

4. Finally, I synthesized the themes and invariant constituents into a composite textural description that captured the meanings and essence of particular aspects of the experiences from each participant that represented the group as a whole. The composite textual description also related statements back to the underlying theories and identified where the themes were consistent with the literature, diverged from it and/or had gone beyond it (Moustakas, 1994).

Due to the nature of the three interview series, member checking was present throughout the analysis phase. As described above, the first interview concentrated on a focused life history followed by an interview discussing the details of the experience of

participating in the Big Idea projects. During the first interview, I kept notes and developed new questions for the second interview. It was during this process, this constant return to the data and to the participant him/herself, that the accuracy of the codes and/or initial understandings took place. However, it was in the third interview that students had the most input into both the codes, their relationship to other codes and the themes that emerged. This was the interview that asked the participants to make meaning of their experiences and to comment on the meanings that I assigned specific phenomena.

IV. Trustworthiness of the study

A. *Validity*

Issues of validity were addressed in this study by aiming for a high level of authenticity, i.e. framing the experiences of the participants in such a way that the findings are valid for them. In her discussion of the double layered community of practice model, Lee (2018) criticizes an all too typical approach whereby existing theory trumps authentic narratives by questioning the point which the researcher must take the participant's experiences seriously. This study accepts the participants' experience as valid to them. However, in order to dig deeper than surface perceptions, the three interview structure of the summative review has many features that enhance validity in the study.

It places participants' comments in context. It encourages interviewing participants over the course of 1 to 3 weeks to account for idiosyncratic days and to check for the internal consistency of what they say. Furthermore, by interviewing a number of participants, we can connect their experiences and check the comments of one participant against those of others. Finally, the goal of the process is to understand how our participants understand and make meaning of their experience. If the interview structure works to allow them to make sense to themselves as well as to the interviewer, then it has gone a long way toward validity (Seidman, 2013, p. 27).

Additionally, findings were triangulated with other evidence in order to support their validity. A constant comparison method was used to increase reliability in this study. As data was coded and analyzed, initial findings and presumptions were compared with other interviews and with the participants themselves to ensure that their statements had been interpreted correctly. Furthermore, some statements made by individual participants were analyzed, interpreted and presented to the entire group for comment and interpretation. This expectation was explained to the students in the initial interview and allowed me the chance to gain insight into word usage, expressions, and hidden meanings. This was especially important in that all but one of the participants were second language learners of English. While their level of English was quite high, given that they were all secondary students at international schools, nuances could be missed if not checked with the participants themselves. While participants were given the ability to comment on the accuracy of the analyses, I reserved the right to “own” the analyses made from the raw data. Finally, the decisions for coding data and clustering codes into themes was made explicit (see Results).

This study is founded on a post positivism paradigm. It is accepted that the background and biases of the researcher as well as the underlying theories of the study shape what is observed. Objectivity was pursued by framing the methods in a logical progression, accepting the varied perspectives of participants and utilizing rigorous data collection and analysis techniques. Furthermore, by involving the participants in checking analyses, triangulating the findings with corroborating evidence and being transparent in the articulation of criteria for elevating certain statements as notable, both transparency and trustworthiness in the study were increased (Seidman, 2013).

However, when the researcher paraphrases a participant’s thoughts or words, reducing the experience to its essence, the researcher’s experiences become evident in the narrative. When it is also accepted that it is impossible to know the exact meaning of the participant’s

statements, we must also accept a considerable tolerance for uncertainty in the study (Seidman, 2013).

B. Potential Research Bias

As noted above, it is impossible for the researcher to completely remove bias from the study. In fact, perhaps it is not even desirable to attempt this. “While life experiences and familiarity with the research context may bias the research, they will also offer important insights (Galletta & Cross, 2013, Ch. 1).” Furthermore, when these experiences are shared frankly, it may help to connect with the experiences of the participants.

I have been involved in online education for a considerable period of time. When I began studying the topic, I was an online education coordinator for QSI and later became the founding director of QVS. Therefore, I had a large stake in the success of our design principles. This is somewhat mitigated by the fact that I had moved on from the organization by the time that I began the summative review (Phase 4) but needs to be recognized as a potential bias.

I was also very involved in the creation of the Big Idea project and facilitated several of them. The Big Idea project was created in a graduate course that I taught and instituted into QVS while I was still the director. I had done considerable research into dropout rates, feelings of isolation and student interaction within an online context prior to this and supported developing the student-teacher and student-teacher relationships in the courses. In order to address this possible bias, the last participant in the interview phase was chosen because she was successful in a program did not include the Big Idea project and I wanted to ensure that alternative explanations were explored. In my current role, several of my students take online classes from external sources. However, I do not have any control over the design of the programs.

V. Limitations

While it may be argued that the study could make “logical generalizations to a theoretical understanding of a similar class of phenomena (Popay, Rogers & Williams, 1998, p. 348),” great care must be taken not to overgeneralize the findings. This study deals with teenage students in international schools whose experience all fall under a mastery learning educational program. While it is hoped that the findings can add to the general theories of technology acceptance, doing so should be with caution. Rather than claim universal application for the findings, this study aims to present the experiences of the participants “in compelling enough detail and in sufficient depth that those who read the study can connect to that experience, learn how it is constituted, and deepen their understanding of the issues it reflects (Seidman 2013, p.54).”

Chapter Four: Results and Discussion

I. Introduction

The general aim of this study was to determine the effects of interaction on perceived motivation to engage and persist in virtual learning. Quantitative and qualitative data were collected to examine the relationship between interaction and student motivation. As the study was grounded in Self-determination theory and influenced by technology acceptance models, data investigating other constructs relevant to those theories were also collected when they were brought up by participants in interviews during the summative evaluation phase.

II. First Iteration: Pilot Research Enquiry

Previous work (Snyder, 2010) indicated strong support for applying the Unified Theory of Acceptance and Use of Technology to virtual learning. However, whereas UTAUT and other technology acceptance models have generally been used to test acceptance and continued use of single user technology applications (e.g. an ATM interface), teaching and learning traditionally occur within a broader, social context. Therefore, I undertook a pilot research enquiry (PRE) aimed at studying the inclusion of social constructs in a technology acceptance model (Snyder, 2014).

A. *Pilot Research Enquiry Quantitative Findings*

The results of the PRE indicated a moderate positive relationship between the constructs of behavioral intention to use the virtual learning environment and performance expectancy (0.68), effort expectancy (0.64) and social influence (0.66) using the Pearson's Correlation Coefficient. A very strong, positive relationship was found between attitude toward the technology and behavioral intention (0.88).

However, the only correlation between socially-oriented constructs and either attitude toward virtual learning or behavioral intention to engage in virtual learning environments was with social influence, i.e. people who are important to me think that participating in the virtual courses is important. Neither student to student interaction nor teacher to student interaction demonstrated a significant relationship to behavioral intention in the PRE.

B. Pilot Research Enquiry Qualitative Findings

Three broad, open-ended questions were also included in the pilot research enquiry survey:

- 1) What did you like best about this online course?
- 2) What was your least favorite part of this online class?
- 3) What could we change in the structure of the classes to keep students engaged in the class?

The responses to these questions were coded and organized into data tables using a modified version of the Stevick-Collaizi-Keen (Creswell, 1998) method of data analysis through the following steps:

1. I isolated *Significant Statements* to create a list of non-repetitive, non-overlapping codes.
2. The *Significant statements* were grouped into *clusters of meaning* within word tables in order to visually represent the emergent themes.
3. These *clusters of meaning* were then used to create a brief, narrative of the *essence* underlying the statements.

I identified the following clusters of meaning in the PRE (See Appendix D for Clusters of Meaning and Associated Significant Statements):

1. *Teacher-student interactions are critical to the success of an online course.*
2. *Lack of student to student interaction can lead to feelings of isolation and loneliness.*
3. *Online courses support feelings of Autonomy.*
4. *Automated interaction with the content itself is important given the asynchronous nature of the online courses;*
5. *Technical difficulties are demotivating.*
6. *Attitude toward online classes is very negative.*

III. Pilot Study Evaluation

The first two clusters of meaning could not be reconciled with the quantitative results and were therefore used to develop the main research interests in this study: teacher-student interaction and student-student interaction. It is possible that the quantitative and qualitative results could not be reconciled due to low levels of interactivity in the courses and that this negatively impacted the results. Even though the initial draft design principles called for integrating interactive activities into the online courses, students indicated very low levels of interaction within their classes. Roughly 80% of respondents indicated they had little to no interaction with other students in the courses. Perceptions of teacher to student interactions were greater, with 50% indicating they had “some” interactions with their teachers and approximately 27% having little to none.

Due to the conflicting nature of the quantitative and qualitative phases and the strength of responses for interaction and feelings of isolation, I chose to continue studying the impact of social constructs, particularly student-student and teacher-student interaction on behavioral intention. Finally, due to the strong impact of attitude on behavioral intention and the positive relationship between voluntariness and both attitude and Big Idea as well as the sparse amount of work done in this field, I decided to consider motivational aspects of

technology acceptance in the main study (Lee, Cheung and Chen, 2005; Hernandez et al., 2011). By grounding the study in Self-determination theory and applying findings from psychological sense of community research (McMillan and Chavis 1986) to the need for Relatedness, I hope to enrich the field of technology acceptance, particularly in contexts involving social interactions such as teaching and learning. Simultaneously I aim to develop a stronger set of design principles to guide online instruction.

IV. Main Study (Second and Third Iterations)

Throughout the second and third iterations, critical incident survey results and teacher feedback in open discussions formed the main basis for modifications of the Big Idea projects. Nearly all of the results of the Critical Incident Surveys focused on facilitating conditions due to technical difficulties. During the online teacher summer workshops, teachers generally agreed that the student-student interactions had a positive impact on the course and that an increase in group work, project based learning and forum-based communication would lead to greater motivation to use and persist in online learning.

A. *Second Iteration*

Following the pilot research enquiry and prior to the second iteration, teachers met in Malta to discuss the findings and to further investigate best practices in online learning. The following design principles were instituted in QVS courses in order to help teachers design their courses and to increase student retention (See Appendix E for a description of each design principle).

QVS courses will demonstrate:

- Transparency
- Chunking

- Interactivity
- Flexibility
- Student Centeredness
- Ease of Use

The importance of these design principles were echoed in the literature they investigated in the summer institute. Additionally, given the failure of the initial recommendations for design to meet the needs of the students, the teachers decided to radically change the approach to the online courses from a platform of isolated, individual courses to a series of courses with integrated, interdisciplinary projects that encouraged student to student interactions across courses. The first Big Idea project (<https://www.youtube.com/watch?v=NkqUsDvezVI>) was instituted in August 2013. In order to give students a voice in the online courses and to identify common strengths and weaknesses in the design principles, a critical incident survey was included in each Big Idea project.

B. Third Iteration

During the summer following the second iteration, online teachers met again face-to-face in Malta to participate in a professional development institute centered around assessing the effectiveness of the online courses in general and the Big Idea project in specific. Overall, teacher discussions during the open forum were positive about the results of student reactions to the Big Idea project with many of them noticing an increase in quantity and quality of online participation. These feelings were substantiated by the QVS usage data during this period. Activity logs for the QVS virtual learning environment were substantially higher during the Big Idea projects, particularly in phase one, than in other weeks during the school

year. This was especially interesting given the fact that Big Idea project participation was voluntary and not everyone enrolled in QVS courses chose to participate.

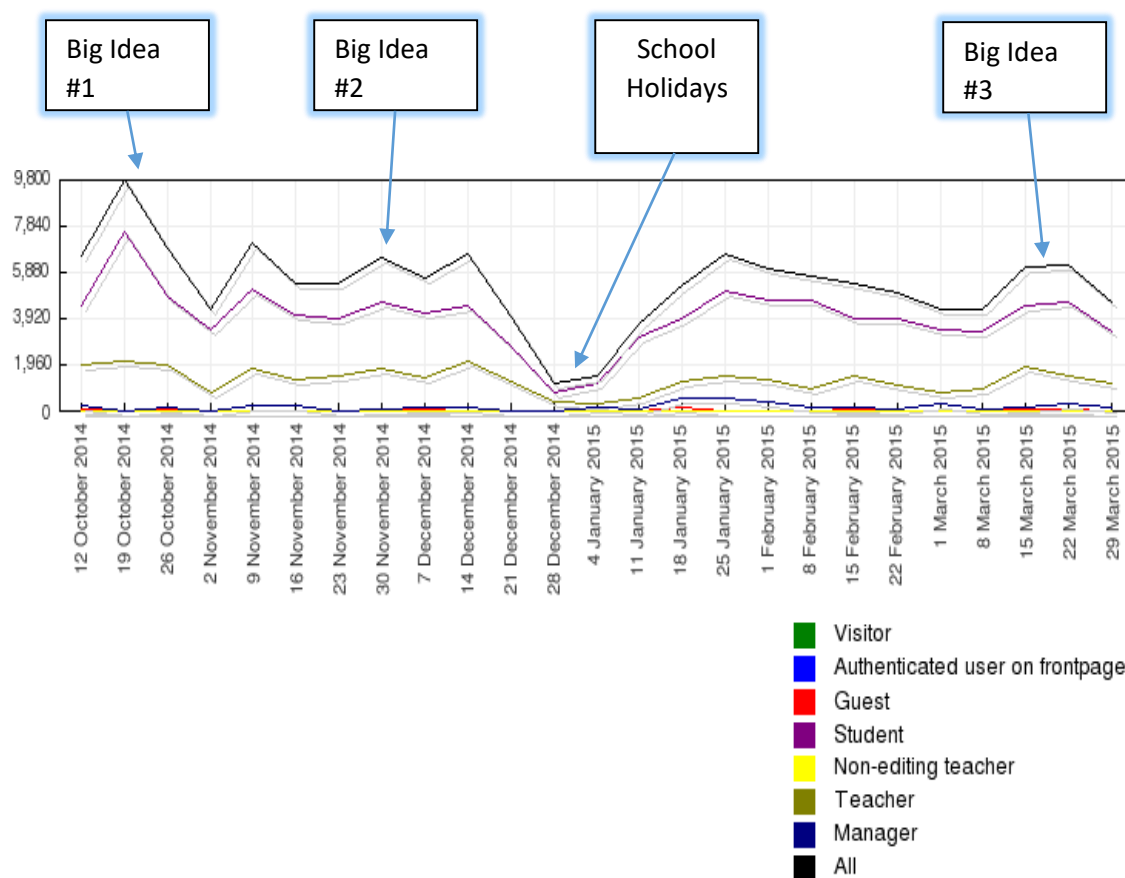


Figure 15: VLE usage data

Due to positive feedback from the teachers and students, the faculty decided not to make dramatic changes to the design of the Big Idea projects during SY15/16. However, the results of the Critical Incident Surveys focused heavily on technical difficulties during the course. As a result of this, a Help Forum was placed on all course sites so that teachers and/or fellow students could immediately address issues. Additionally, the Math and Science teachers felt that teacher-student interactions might be more important as a Relatedness-supporting intervention than student-student. Consequently, teachers were encouraged to participate more frequently in Phase 1 of the Big Idea project and the fourth Big Idea project of the year was designed as a culminating activity for an independent research project. Nearly

all interactions in Big Idea project four occurred between students and teachers in order to investigate the impact of increasing student-teacher interaction on perceived motivation.

V. Summative Evaluation

The final phase of data analysis was a summative review of the successes and failures of both the online courses as a whole and the Big Idea projects. Seven students were selected to engage in a three interview series. The students represented a mix of small, medium and large schools in QSI as well as a more or less even split of male and female. This section provides an overview of the general demographic statistics of the students, a narrative description of the participants, results of the horizontalization and reduction processes and a description of the themes that I identified from participant responses. The results from the summative evaluation form the bulk of this chapter.

A. *Selecting Participants/ Descriptive Statistics*

The summative evaluation of the study involved a series of interviews with students taking online courses through Quality Schools International Virtual School. I employed a purposeful sampling strategy in order to ensure students from small (less than 100 students), medium (100-200 students) and large (200+ students) were represented in the example. The following two tables breaks down key demographic statistics that were included as well as a narrative description of the participants.

Size of School	Gender	Home Country Location*	Home Language*	Year in School	Location of School
Small (2)	Male (4)	North-America (2)	English (3)	Secondary 2 (2)	South America (1)
Medium (3)	Female (3)	South Asia (1)	Russian (3)	Secondary 3 (2)	Europe (3)
Large (2)		Eastern Europe (2)	Spanish (1)	Secondary 4 (3)	Asia (3)
		Central Asia (1)	German (1)		
		South American (2)	Hindi (1)		
	*One student was from a mixed family with two home countries				
	**Two students spoke both English and an additional language at home				
	The last four years of high school at QSI are called Secondary 1-4. Secondary 1 (14-15 years old), Secondary 2 (15-16 years old), Secondary 3 (16-17 years old), Secondary 4 (17-18 years old).				

Figure 16: Summary of demographic data

Participant	Narrative Description
Tammy	Tammy is in her third year of high school at a large school in Eastern Europe. She is originally from Central Asia. English is not spoken at home.
Traci	Traci is in her third year at a medium-sized school in Central Asia but her peer group is limited to a small number of high school students. Traci is attempting to graduate a year early from school. She is originally from South Asia. She has identified herself as highly extroverted. English is one of two languages spoken at home.
Ann	Ann is in her second year of high school in a large school in Asia. She holds two passports but has grown up exclusively outside her “home” countries. English is one of two languages spoken at home.
Jason	Jason is in his second year of high school at a small school in South America. He is one of two high school students. He is originally from North America and English is the sole language spoken at home. Jason has stressed repeatedly in his interviews that he is not a social person.
John	John is in his last year of school. He is the only high school student at his school in Southern Europe and is forced to take all of his face-to-face classes independently. He is originally

	from South America and does not speak the language of his host country. English is not spoken at home.
Nick	Nick is in his third year of high school at a large school in Central Asia. He is originally from Eastern Europe. English is not spoken at home but he speaks one of the official languages of his host country.
Reed	Reed is in his third year of high school at a large school in Eastern Europe, which is also his home country. He transferred into his school from another school recently and is seeking to earn graduation credits as quickly as possible. English is not spoken at home.

Figure 17: Narrative description of demographic information

B. Horizontalization and Reduction

During the first step of data analysis within the summative evaluation phase, I performed a process of horizontalization, whereby each statement of the participants was given equal weight and assigned a code or node as it called in in the NVivo 11 qualitative data analysis package that I used. Through this process, I identified sixty-two initial codes from the transcripts (see Appendix F). In the second step, I reduced the statements and codes, eliminating overlapping codes and combining similar ones in order to identify all invariant constituents of the experience. This resulted in the smaller and stronger set of codes below:

Reduced Codes		
Authentic learning		Facilitating Conditions
Autonomous Behavioural Regulation		Interaction
Autonomy		Interactions impact on needs
Competence		Internalization
Competence through Relatedness		Motivational Continuum
Competence-Autonomy		Novelty and change
Controlled Behavioural Regulation		Relatedness
Effort Expectancy		Stress of SDT Constructs
Enjoyment		Success of BI
f2f vs. OL		Success of QVS

Figure 18: Reduced codes

C. *Identified Themes*

This section includes a composite textual analysis of overarching student perceptions regarding their motivational needs. This was developed from three interviews. In the first two interviews, I asked participants to focus on distinct events in their face-to-face and online classes. In the third interview, I worked with them to make meaning of their statements. I clustered the invariant constituents into the following themes in order to move the focus of the study away from individual interviews to data across the interviews. Each of the participant responses in the themes/subthemes are samples of a response from an invariant constituent but not all possible participant responses falling under each theme are included in the tables in the Appendices (G).

Theme	Subthemes
Autonomy, Competence and Relatedness in an Online Context	<ul style="list-style-type: none"> • Inseparable constructs • Autonomy online • Competence online • Relatedness online <ul style="list-style-type: none"> ○ Membership ○ Influence ○ Integration and Fulfillment of Needs ○ Emotional Connection
The many impacts of Interaction	<ul style="list-style-type: none"> • Interaction can increase regulation • Interaction can impact on Autonomy, Relatedness and Competence • Lack of Interaction leads to Isolation

	<ul style="list-style-type: none"> • Student-Teacher Interaction verses Student-Student Interaction versus Student-Content Interaction
The Motivation Continuum	<ul style="list-style-type: none"> • Controlled Regulation • Autonomous Regulation • Internalization

Figure 19: Themes and Subthemes

D. Autonomy, Competence and Relatedness Online

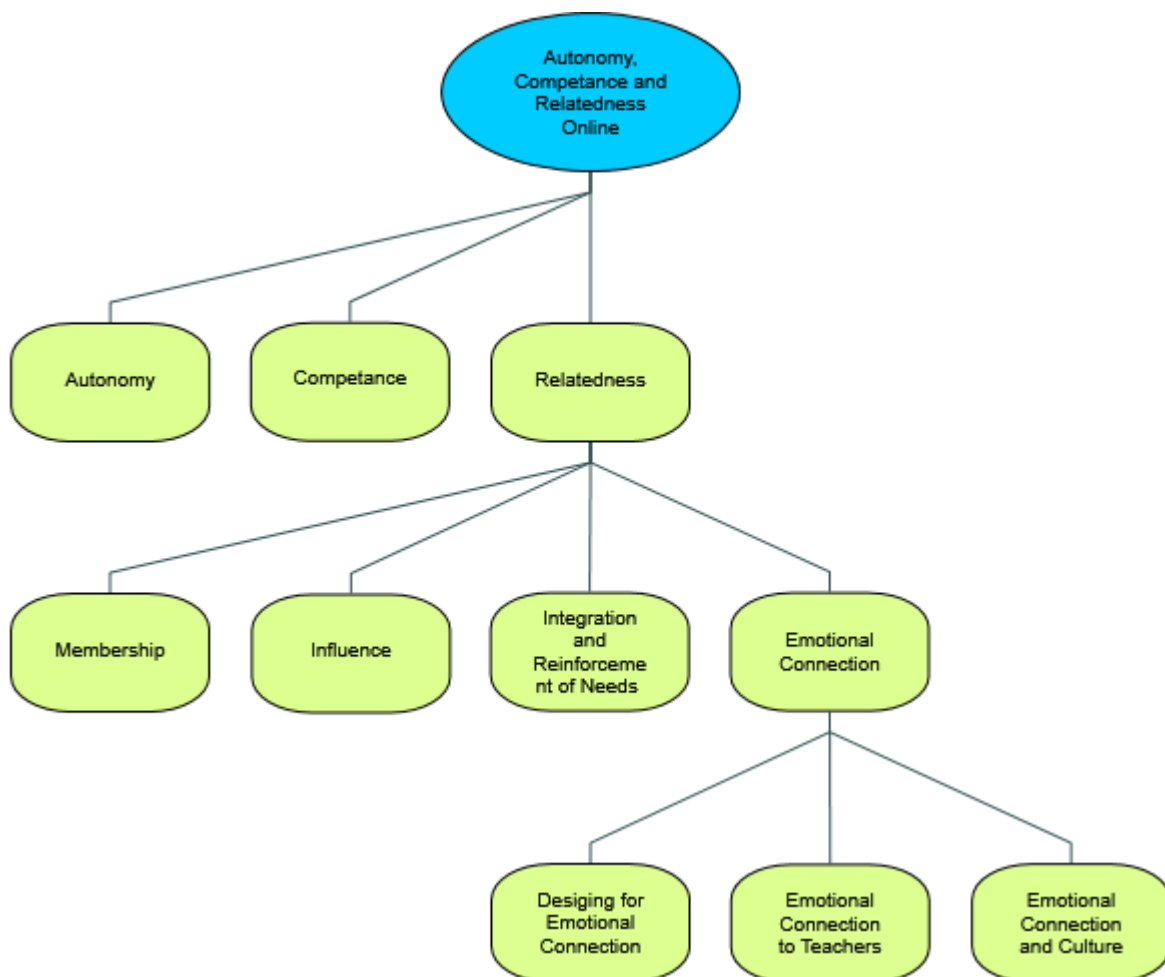


Figure 20: Theme 1 Autonomy, Competence and Relatedness online

As many participant responses stressed the fulfillment of one need as a support of fulfilling a different need, this seems to support the idea that the needs of Self-determination theory are important in and of themselves but are also inextricably connected to one another. For example, in the third interview, during our discussion of Self-determination theory, John felt that, “Autonomy, Relatedness and Competence are important just by themselves. They might be connected but they are important needs by themselves.” While it may appear that this concept is supported in the literature, the majority of work has focused on the interRelatedness of Competence and Autonomy (e.g. Bryk & Driscoll, 1988; Ryan and Deci 1996; Ryan and Deci, 2000a; Ryan & Deci, 2000b; Rovai, 2000; Hadre et al., 2006; Fagan, Neil and Woolridge, 2008; Lillimyr, Sobstad & Marder, 2008; Deci & Ryan 2012) and few have looked at the interRelatedness of either need with Relatedness except as a means to facilitate the process of internalization (Niemic & Ryan, 2009).

The participants’ statements further demonstrated that online courses have the ability to support Autonomy, Competence and Relatedness, albeit differently than in a face-to-face context, and that the needs influence each other. Reed described a situation where technical constraints of the online environment challenged Competence but where relational support from peers could address the issue:

As I said before you get to learn kind of more easy [online] and sometimes that I just think that teacher does not understand your words and that’s when your fellow classmates come for help...It’s impossible to learn without friends. I think when you have friends in class and you talk to one another, you teach one another, therefore you learn better...Relationships help Competence.

Furthermore, Ryan and Deci (2000) held that individuals would choose domains that best suit the fulfillment of their needs. This could mean that some students are more inclined to feel supported in an online environment while others may be more suited for a

face-to-face context. Jason actually prefers the online environment because he feels that

Relatedness creates a challenge to Competence in the face-to-face context:

I feel kind of distracted when students are telling jokes or anything [face-to-face]. And it makes me feel more like the work is more important, maybe. Because when you're in a classroom, teachers are rushing in and giving you all of this homework, and kids are cracking jokes. I don't know, I just think it cuts into the seriousness because you're not able to be serious. I mean, you're able to be joking and stuff.

However, John mentioned experiences in a different online school:

In my experience I always was behind in the FLVS and the main reason for this was because of the interaction between the teacher. For some reason, the teacher was always busy and I had to make an appointment to talk to him and sometime this took a week or so and this made it difficult to finish my work.

In terms of SDT supports, Chen (2007) noted that the online environment was actually richer in potential variety of resources available to students, making it a viable option for both Autonomy and Competence supports. Tammy's feelings echoed this sentiment:

All the things that's better, the fact that I don't have to read the book for US History, I can use the Internet or I can actually use the like library resources or the unit activities to acquire the knowledge but in my health class I was having to carry this huge book, had to read that, then I would have to find the questions in the book and answer that [*her tone was very negative about health*].

Furthermore, Bachman and Stewart (2011) listed social factors like student-teacher interactions as a way to facilitate perceptions of Autonomy, Competence and Relatedness.

Most participants believed that the fulfillment of one need could well support a different need in an online context but that they could also work counter to one another. For example, online courses are known for supporting Autonomy through their asynchronous nature (See Autonomy below). This means that Nick can feel that Autonomy supports built into the online structures could thwart Competence because, "[Finishing your work on time]

works better in the face-to-face than in online courses simply because of that freeness.”

Additionally, this lack of definitive, time-based structure also makes it difficult for some students to establish Competence-supportive relationships with their teachers:

One disadvantage that I've experienced is kind of that you don't have a teacher, like a teacher that gives a lesson and at the end of the period and the lesson is over and the students leave the class. Well in online courses students have to finish the work by themselves. Of course the teachers give you the work and support you, assist you but it's not like--it's different because in a class the teachers actually do it at the same time together with the students and they know when they finished something and completed the task. That just leads like online badly to falling behind sometimes or things like that, not finishing all the assignments (Reed).

Recognizing this need, Hadre and Reese (2003) called for designers to develop supports to help students meet their need for Competence and lower drop-out rates. This remains a concern in online programs, including QVS, today.

1. Autonomy

Online courses have the reputation of being Autonomy-supportive (Tunison & Noonan, 2001) and many structures exist in the QVS virtual learning environment to support development of personal vision, thus increasing task value and relevance. The majority of participants commented on the freedom to tackle tasks in the online courses at their own pace as a positive. It allowed them to focus on their online tasks without being limited to a time-based curriculum and to put aside their online tasks without penalty when they needed to focus on something else. This freedom of pace also applied to time of day and location, i.e. participants did not feel that they were limited in their ability to engage in their online learning by traditional factors or resources. For example, John specifically mentioned the freedom of time and place as a positive feature of QVS courses:

I like the [courses] that are online so I can go at my speed...People can work more freely. They can work at any time they want to and they can decide if they want to focus on that one subject for a specific time then like intensively do that and then maybe stop working on that subject and focus on something different. And these things are, of course, advantages.

Many studies have drawn similar conclusions about the advantages of online programs in allowing for freedom of pace, timing, scheduling, use of resources and location (e.g. Rice, 2006; Katz & Assor, 2007; Sigles & Momino, 2007; Roca & Gagne, 2008; Reid, Aqui & Putney, 2009; Fischer, 2009; Wicks, 2010; Bachman & Stewart, 2011; Guyan, 2013).

However, Delahunty, Verenikina and Jones (2014) point out that the added power of choice in an online context also includes the power to choose not to appropriately engage in the learning objectives. While this sense of freedom that participants identified is not definitional of Autonomy itself, it can be supportive of its development (Shrunk & Usher, 2012).

Conversely, and perhaps more importantly, an overly controlling online environment could lower perceptions of Autonomy and, thereby, negatively impact behavioral intention (Ryan & Deci, 2000). As mentioned above, Autonomy denotes both integration and freedom. It is “the organismic desire to self-organize experience and behavior and to have activity be concordant with one’s integrates sense of self (Deci & Ryan, 2000, p. 231).” An overly controlling online environment could limit chances to self-organize the experience, thus thwarting the development of perceptions of Autonomy and negatively impacting behavioral intention to engage in the task.

This freedom that is associated with online Autonomy supports could also impact Facilitating Conditions by allowing the students to move on to something else if there is a technical difficulty with a particular activity. This addresses a concern in the UTAUT model of technology acceptance (Vanketesh, 2003), which posits a direct impact of facilitating conditions on behavioral intention. Tammy recognized this as a positive design feature in QVS courses:

If something is not working, I just move on to the different activity that I had to do so to me it doesn't even matter...if just like one thing isn't working then I'll just move on to the next. The design of the unit is important for controlling that possibility of something not working.

Other supports within the structure of online instruction included an increase in access to a wider diversity of courses and resources that were more closely aligned to personal interests (an Autonomy-supportive situation). Due to financial constraints, these courses would not have been available without the supplementary online school (Delahunty, Vereniukina & Jones, 2014). While this is a primary concern to smaller schools as a cost saving measure, participants at larger schools benefited from this feature as well when scheduling limitations prevented them from enrolling in required courses (Huett, Foshay & Coleman, 2008; Fisher, 2009). For example, while Jason has to take online Math courses because he is at a very small school without a “*specialized teacher in mathematics*”, Ann is a student at a large school but was only able to pursue higher level Math coursework locally by taking an online course:

[Online] US history has helped me focus on classes that I think are more important. For example, I would not have been able to take Pre-calculus as a sophomore if I hadn't taken online US history and because I am looking for careers in the science and math range, the class helped me focus my effort in the future I want.

Within the Big Idea project, participants mentioned the ability to further explore the topic and even the ultimate freedom to choose not to engage in a particular Big Idea project when their workload in other classes or other aspects of their life was too great.

Vansteenkiste, Lens and Deci (2004, p.22) wrote that Autonomy-supportive contexts “allow opportunities for self-initiation and choice.” Reed explained that in the Big Idea:

You can post as much as you want, you can discuss anything as much as you want, you can have like 20-page discussion about philosophy. Anything works

and that's why I think it's like all about the power, the power of words kind of. And the actual [benefit] of the Big Idea is, I think, that we can choose to do or not to do. Like we decide for ourselves.

While this was not one of the initial goals of the Big Idea project, it was one of the design principles developed for the second iteration to be instituted in all QVS courses. This freedom to go further in a given topic proved more difficult than was at first anticipated in the courses but appears to have been successful in the Big Idea project. This especially supports that part of Autonomy concerned with the investigation of topics that have intrinsic interest (Katz & Assor, 2007; Harnett, et al., 2014).

2. Competence

Participants remarked on several advantages that the online environment offers to support the development of Competence. When Competence needs are not met locally, whether due to lack of appropriate courses or personnel, online courses become an option. Due to the same freedom of pacing and an academic focus of interactions, participants also felt that online courses were more focused than their face-to-face counterparts. Hernandez, et al. (2011) felt that these characteristics could lead to a greater knowledge transfer, i.e. were supportive of developing perceptions of Competence. Lynch, et al. (2009, p. 280) further found that virtual classes were “a more efficient use of their time.”

The ability to produce higher quality, authentic work with time to think about responses before posting them was listed as a Competence-supportive element echoed in several studies (e.g. Fisher, 2009; Bauerlein, 2011). Other characteristics of Competence-supports in an online context were also supported by the literature. Participants identified activities as more authentic in an online class in comparison to the simple book-work typically found in their face-to-face classes (van Raaij & Scheper, 2008; US Department of

Education, 2010a). These characteristics led Tammy to identify her online class as more supportive of higher order learning than an equivalent local course and John to state, “if I compare it to all my other courses even my actual school I’ve been going on, I feel more like I have learned more in the QVS site.” This goes even beyond the claim of Barbour and Mulcahy (2009) who found that there is no qualitative difference between online and face-to-face classes. Nick further noted the acquisition of skills associated with online coursework as an additional Competence support that was worth the effort regardless of the actual course content, “By doing online courses, you get familiar with a completely different style of learning and you do acquire some skills and, yeah, that's probably the reason I would take online courses if I hadn't taken them before.”

Still, the online environment poses some challenges to Competence as well. Technical issues in the online platform can often make it difficult for participants to complete their learning objectives. Tsai et al. (2008) noted that the effort to learn how to use the technology tools associated with the online activities could also thwart perceptions of Competence, while Fullan (1999) stated that mastering the unknown could lead to feelings of anxiety, thus negatively impacting behavioral intention to persist in the use of the virtual learning environment. The effort expectancy of learning how to use the platform negatively impacted another of John’s initial perceptions of Competence:

In the first year I didn’t really like them [online courses]. I was kind of scared of them because you know all these projects and I had no idea how to work like a scanner or Microsoft Paint or anything. All of the technical issues made it difficult. For example, during the first year, I didn't know anything about how it worked and so it was hard for me to integrate because I didn't know how it worked. That made it hard for to complete things on my own. [structure] is important for me to be successful... it all has learning curves to some extent.

Furthermore, the scheduling of one of the Big Idea was during his school's holidays. As Big Ideas are asynchronous but same paced within a specific window, this made completing the assigned work difficult and negatively impacted his perceptions of Competence, "I could not do anything about it. If I could do a test before the holidays, I am sure I could have [gotten an A that way instead of doing the Big idea project." These challenges need to be addressed through more appropriate instructional design considerations in order to facilitate a more Competence-supportive environment.

3. Relatedness

Initial data analysis began using a priori codes to investigate dimensions of Relatedness drawn from the four elements of psychological sense of community (Membership, Influence, Integration and Support of Needs and Emotional Connection) in an effort to create a more detailed understanding of Relatedness as a basic psychological need. Nearly all participants felt that Relatedness needs were important to them as part of their educational goals as well as their overall well-being. This is substantiated by Thomas, Herbert and Teras (2014, p. 76) who found that Relatedness in an online context, "emerged as an important part of the educational experience." Lillimyr, Sobstad and Marder (2008, p. 18) indicated that a "sense of Relatedness to be a quintessence" in developing interest and engagement online, further supporting the findings of Furrer and Skinner (2003) who believed that social factors were central in supporting children's motivation.

While Self-determination theory postulates that it is a "part of the adaptive design of the human organism...to pursue connectedness in social groups (Deci & Ryan 2000, p. 229)," many studies in motivation and even in applications of Self-determination theory have ignored Relatedness or chosen to focus on a limited aspect of it. Even when Relatedness is considered, Furrer and Skinner (2003) found that most studies focused on student-teacher

relationships, ignoring student-student Relatedness. While Hadre et al. (2006) raised the influence of peers in supporting the sense of Relatedness, they still focused on the importance of teachers in this role. Still, Wigfield, Cambria and Eccles (2012, Ch. 26) did indicate that “peers may play an especially important role vis-à-vis motivation during adolescence.” This finding is especially important for online high schools that seek to support Relatedness needs.

For many students at online schools, Relatedness needs will be met outside of the online classes, within peer groups in their home communities. However, for others, particularly those from schools with a small secondary population, Relatedness needs can only be met through online interactions. Therefore, if design principles are not instituted that support Relatedness needs, students like John could be left in a situation that threatens their psychological well-being:

I am not able to get any interaction with people my age locally in my school. When I go out, it's hard to find people my age. The school (negative tone), you know, it doesn't really provide any help in meeting people of my age. I'm 17 and the closest to me in my school is 15 and the rest are a lot younger. If I could, I would make this school bigger.

Jason is in a similar situation. There is only one other high school aged student in his school and he is not able to meet his Relatedness needs in the home community.

There's just nothing to do [in the country I am living in]. I don't know. There's really nothing to do here. And I just can't... in a way, I'm just in the mode where I just want to be back with friends. I miss the US. I presently have no social life outside of school. I live in a country where most of the people don't know English. I don't really go out too much... I have a house, but then there's this compound where I live. It's like a military base. And it's quite small, and all the kids there are, like, 8 years old and under. My social life, in terms of what it, what does social life mean to me, I think, I'm not sure that it's necessarily very important, but I do like being able to talk with people every now and then... *and because of the lack of, like, social, or a lack of classroom discussions in real life it kind of makes me want to have these forum discussions and things with other people and other students [online].*

The good news then is that it does appear possible to design online programs that support Relatedness. Traci also felt that her online interactions were not only important to her

but also successful in meeting her Relatedness needs and that they were actually more important to her than her face-to-face ones

I think peer relationships are important in and of themselves because I am pretty extroverted and I really like talking with people and getting to know different kinds of people...I do like to have relationships with my peers just for the sake of the relationships. I don't think [having a local community] really effects [my online community] at all for me because I still think of everyone in my online course as real live person. It's kind of weird. I kind think of them like normal people I know. And I don't know many teenagers, so I think my online community is more important than my real life community here.

White (1997, p. 118-9) stated that, “unlike any previous generation, today’s younger generation have the opportunity to communicate with people and organizations on a global scale.” Since writing this in 1997, improvements in information communications technology have only increased these opportunities for global connectedness. Perhaps because of this and the movement of interactions into social media applications such as SnapChat and Facebook, the lines of the physical and virtual worlds have become blurred in terms of adolescent relationships, particularly when the face-to-face opportunities are limited.

In the third interview, Jason substituted “school” for “home” when talking about his online classes. When asked to elaborate, he said, “[It’s because] it’s where the people are, the people I talk to. So, when there’s good days, when everything seems to go your way, school feels like home.” This seems to indicate a level of volition in choosing a context that best suits the meeting of Relatedness needs (Ryan & Deci, 2000b). However, Jason’s case may be unique in the extreme lack of Relatedness supports that he experiences in his home community. He frequently expressed feelings of loss, loneliness and frustration with his face-to-face community and his statements about the importance of Relatedness contradicted one another throughout the interviews. He appears to have settled on Competence as a *replacement* for Relatedness (Chen, 2007). This has created an unhealthy reaction where “basic needs are not satisfied [and] people will often compensate by developing need

substitutes that can have immediate and long-term negative consequences (Ryan & Deci, 2000b, p. 329)

This feeling that Relatedness needs could be met through an online community was particularly true when considering the Big Idea projects. Students noticed that levels of participation and interaction were considerably higher than in their regular online classes.

[The Big Idea Project] is a really good opportunity to get to know more people and teachers from the online community. I notice in class when the people who are in similar courses like when we are all doing the Big Idea, we are discussing like, “Did you see the Big Idea was open” and it’s just like only us who know what’s going on and I think that is kind of cool because we have our own community (Traci).

Furthermore, throughout the interviews, participants spoke positively about their student-student interactions within Big Idea projects, using words such as “fun” and “need” to describe their participation in it. This indicates a higher level of autonomous motivation than in other classes and this should lead to an increase in behavioral intention.

a) Membership

Membership, the feeling of a personal connection or belonging, is an element of psychological sense of community and is often characterized by boundaries in geo-spatial communities, or by conscious identification in communities of interest (Obst, Zinkiewicz & Smith, 2002). Participants in QVS courses indicated that they felt they were a defined community of learners with relational boundaries as opposed to physical ones. John felt that students in QVS formed, “a unique group,” who were, “all talking about the same subject and helping each other to find the answers and agree with each other.” They generally felt at home in the online classes and could relate well to other members. Hargreaves, Earl and Ryan (1996) indicated that students had an increasing dependence on peer groups in their adolescent years and Fielding (2001) reconceptualized the traditional definition of

community, describing communities of interest designed to meet specified learning goals instead of purely geographically defined communities. Recognizing that both students and teachers are key members in online classes becomes an important part of supporting concepts of Relatedness.

In addition to a defined boundary as a hallmark of membership, the Sense of Community Index uses the concept of “knowing each other” as an additional indicator. Many participants in QVS indicated that their interactions in the online classes and the Big Idea project were enough to allow them to get to know each other, especially within the online forums. This phenomenon was describe by Ice, et al. (2007) and further elaborated in the work of Delahunty, Verenikina and Jones (2014, p. 246), “when a student contributes to an online class in some way, they engage in a process of portraying something of themselves to the group, with unfolding clues about who they are, what they know, what they value and how they thing.” Traci’s also beliefs support this concept:

I guess they know me, kind of know me, based on my replies and comments and because we, like, when we comment and read each other’s replies...I think besides for one of two people I know everyone on my online classes in QVS.. my classmates [also] know me as well as I know them.

Unfortunately, this feeling of membership was not universally felt in all classes or amongst all participants. John felt that he didn’t “talk to any [classmates] except during the Big Idea project...I do not know them as much as I know other people [face-to-face].” Given that John and several others did not feel that their Relatedness needs could be met in their face-to-face community, this inconsistency of Relatedness support hinders the ability of the QVS online classes to fully support membership in a community and, thereby, meet Relatedness needs.

b) Influence

Too often, online classes are overly teacher-driven which can impact overall effectiveness due to the lack of appropriate influence of students in the learning process (Boling et al., 2012). There was a united consensus amongst participants that students had influence in QVS courses. All students believed they had some influence and control into how the course progressed and felt they also had input into the shape and direction of the content, especially in the Big Idea projects. Reed felt that participation in forum-based activities transferred control from the teacher to the students:

The forum [part of the] class is fully controlled by us and that's where we discuss our opinions. That's where we have the power. We have quite a lot of influence in the Big Idea project because everything pretty much depends on you. You make the post; you do the work. I believe we control about 75% of the work we do.

Being able to give individual opinions and input mattered to participants and the actions of the others mattered to them as well. There was general consensus that the participants felt they had a say in what happened in their classes, particularly in the forums leading to a situation where learning is “done **by** not done **to** the participant (White, 1997, p. 101).”

I guess, most of the influence I do is in like forums, so like US History. I can make more own statements and, like, you know, give my own opinions.. In the Stage One [of the Big Idea project] students do have quite a bit of control over their content because the content is what we are posting. And I think Stage One is actually my favorite part, because you get to express your own opinions (Tammy).

The prevalence of forum-based activities in the Big Idea project and in some of the regular classes led to stronger perceptions of influence and feelings indicating stronger autonomous motivation.

Influence is also characterized by a recognition that others' needs and opinions are important (McMillan & Chavis, 1986). This was quite evident in participant statements.

Participants crafted their posts carefully within the Big Idea project in order to avoid creating conflict or not honoring the work of others. They expressed care about the others' opinion of them:

I want to fulfill the task. I want to complete it successfully. And at the same time, I think about whether it could offend someone or something like that or yeah. And so, I consider what my classmates would think about what I write when I write something or making comments. Well, when I post something I don't want to offend someone or anything or when I write a comment on their post and again I don't want to offend anyone just to be right, something like that. No, I would care how they would react to my post (Nick).

This is not to say that they were always in agreement with their fellow students. Indeed, participants appeared to value the diversity of opinions as a way of achieving new insights into complex problems (Fullan, 1999). Furthermore, there was also a belief that isolated problems could be solved if they ever did arise in the online interactions. Traci noted that, "there are some, like, disputes about opinions and stuff but we just compromise and we understand each other's point of views." It is interesting to note that feelings of getting along with one another may be exaggerated in online interactions where extreme politeness often exists in response to several factors that may include the fact that the words are a part of a permanent record (Price & Oliver, 2007).

Participants believed that the opinion of the other students was important and they recognized that they had ample opportunity to demonstrate the concept of influence through active and reflexive persuasion. They believed they had the opportunity to persuade others to their point of view and that, at the same time, participants were open to the possibility that others, and even the process of participating in the Big Idea project, could persuade them to a new viewpoint. This idea was previously uncovered by Mitra (2001). For example, John noted:

I have been influenced by the Big Idea since it shows me new things and more than just facts, I've learned more opinions than I've ever seen in my life. Sometimes when I read the comments from the classes I read others' opinions about it, even the teachers, and I get to influence a bit sometimes.

Jason also offered an explanation to the often explosive start of posting in the Big Idea projects. He felt that students were influenced to participate through the posts of others.

I think it's just like they're working on different units while the Big Idea's on and they see that nobody has responded yet so maybe it's not like that week or something. That happened to me last year when I wasn't sure which week of the Big Idea we were in. And then they see somebody respond and it's like, Oh Dang, I got to get there got to finish the work.

This engagement with others and their words, bound up in their posts, demonstrate the value that the participants placed in Relatedness to their classmates. It further demonstrates the degree of influence that they have in their online classes.

Additionally, participants universally felt that classroom structures were in place to allow them appropriate influence and that they were comfortable enough with their teachers to allow them to quickly work with them if any problem arose in the class. For example, Ann thought that, "teachers can make mistakes sometimes. However, it is easily solved because all you have to do is email them about it and it gets fixed easily." None of the participants seemed bothered that technical problems existed within QVS. They felt that they were an inevitable part of the online experience and were easily fixed, thus exhibiting perceptions of positive facilitating conditions within the QVS structure (Vankatesh, 2003).

What is especially surprising, however, is the degree of influence the students felt that they had over the actual structure of the course and the activities in it. While ceding authority to the teachers to create assignments and assign tests, they felt that they could negotiate with the teacher if the work got beyond them. Nick mentioned the following example:

For unit 6 we had quite a lot of work and Traci and me wrote an e-mail to [the teacher] telling him that we have too much to do for one unit and he changed the workload. So I guess we have some kind of influence.

In at least one instance, the content of the Big Idea was actually tailored to a participant's interests based on a conversation that Traci had with her teacher.

I told [the teacher] that I'm really interested in epidemiology and like working with pathogens and stuff like that. And so, for this Big Idea, he built the whole stage two of the project around that.

Student voice appeared well-developed in the responses of the students, indicating a bi-directional trust throughout their participation in the Big Idea projects. Rovai (2001) identified the importance of reacting to the needs of the students and the learning environment as an influencing factor for determining the appropriate learning activity. Fielding (2011) stressed the value of teachers as active listeners and co-learners in the class, tailoring instruction based on the interactions of students. These studies, at least, support the idea that influence is very important in achieving the desired learning outcomes and that influence is a bi-directional concept based on the needs of the moment and can support perceptions of Relatedness as well as being supported by perceptions of Relatedness.

c) Integration and Reinforcement of Needs

It is clear from the interview data that most participants felt that their self-identified needs were being fulfilled in the online classes, i.e. that their participation was providing them with what they expected and wanted in their online classes. For the most part, identified needs were centered closely around and limited to academic goals. Participants identified limited focus of shared values, based on academic values such as exploring topics, mastering skills and receiving an "A" in the Big Idea project:

Well I know what I want. I want to learn the subject and get good grades and successfully complete it in a year. I guess most people would agree with that, want to learn, get good grades and finish the course probably (Nick).

However, Traci believed that not all of the students took their work seriously enough and felt a bit cheated in terms of academic fulfillment:

A lot of times I feel like I'm giving like really detailed and elaborate answers [in my posts] while there are just people who are just putting in minimal work...and so that's where I kind of feel that some people...not everyone shares the same academic values as me.

Several participants also felt that the actions of their classmates and teachers helped fulfil their needs and supported their underlying academic values. They all felt that teachers made efforts to support their learning and that most of the other students wanted the same things from the class, e.g. earning an A, going beyond the boundaries of the assigned courses and to improve their overall skills. Tammy explained that:

If she [my teacher] feels I need to learn more, then she would give me more resources and she would like tell me more about her knowledge and she would broaden my knowledge, I guess. If I do well, she's very nice and she feels proud of the stuff. She's like, 'oh great job, I really like this, you've improved so much you know.'

Participants also felt that participation in the Big Idea project supported them in fulfilling their academic needs by broadening their access to different viewpoints through forum discussions and online interactions. Tammy further commented on how this impacted her motivation:

I would agree that it is very important for me to participate in the Big Idea project because I really enjoy reading what other people find. Usually, they find something really interesting I didn't hear about or something I didn't consider, their opinion. It's motivating to see, to hear, different opinions on topics or what, what's really surprising and motivating is how people find things you didn't find when researching a topic. And this is real speed race how, how when I repost, each of them differs because they all found from something different. That's the motivating part for me.

d) Emotional connection

Statements concerning emotional connection solicited more reactions (123 initial coding references) from the participants, more than any other code with the exception of student-student interaction (143 initial references). Participants felt that they shared deep emotional bonds and Reed believed it had become a spiritual connection:

The other students don't know me physically because they only have a picture of you to follow. But spiritually they know me pretty well. I thought in some cases they might even know me better than the ones in real class. Sometimes we disagree with the opinion of one another but we're still like one big ball, yeah, I guess a family, sure why not. It's like you always have the struggle between those two brothers or two sisters because they might pick on you. But they are still family. They still like each other. In the online class we grew up together because we got to know one another... We got to learn new material together. We got to the same information. You know, when you have twin brothers or sisters, you pretty much grew up together as one because you have the same kind of clothing, the same food, the same parents. Here you pretty much have the same kind of thing because it is a big family. Your teacher is your father, mother, your parents. The other students are your brothers and sisters. You have the same clothing because you learn the same kind of information although you might sometimes have different opinions because, well, you have different identities and cannot think the same. Just like in the real world.

Participants also felt that the online students got along very well on a day to day basis. Many statements centered around how “nice” or “cool” other students were and Jason even commented that, in his online work, “I'm proud of not only myself but other people as well.” Where differences or arguments existed, they felt they were all settled politely and amicably. Finally, as in face-to-face communities, some participants felt that they developed deeper emotional connections to certain students than to others in the group, mentioning individual students without being asked about them.

(1) Designing for emotional connection

Participants felt that instructional design elements could be used to develop or deepen emotional connection. Several course activities that encouraged sharing of opinions or

personal information were listed as exemplary. Participants mentioned on numerous occasions that their interactions, especially in the introductory posts and in the Big Idea discussions were important to help them develop an understanding of and connection to the person behind the post:

[The most important part of the Big Idea project] it's kind of not even the Big Idea itself. It is the introduction because I feel I went to every single person on the forum and I called everyone just to know at least something about the person. And that's what means the most for me because I get to know what the people do, what they think about, what they are like (Reed).

Traci adds:

[I know most of the people in the Big Idea project] because we had those introductory forum posts...I really [like them] because it kind of lets me know more about who I'm working with. The Big Idea also allows us to get to know each other more because we get to express our opinions in so many different topics and like, um, that helps me know and analyze my classmates better. So that really helps build a sense of community because you get to know each other better.

It is possible that the inclusion of these non-academic forums was instrumental in developing emotional connection (Barbour & Plough, 2009). Participants also mentioned other examples of instructional design that were successful at increasing their emotional connection to their classmates. These included a specific Big Idea project where students had to post an audio recording of their own voices in the answer and a Pop Culture project in which they had to identify and discuss their favorite music and artists.

The class structure, including many elements of the Big Idea project, seemed to encourage a sense of emotional connection to develop for some participants, especially when the student felt shy in the face to face environment. For instance:

Yeah, I feel more part of it, more, like giving, being a notable part of the conversation, and maybe not funny, but expressive. I don't know. I'm not really a social person. I don't talk too much. But when it comes to online

classes, I think it's easier to talk with people through words and text rather than talking to people [face-to-face] (Jason).

(2) Emotional Connection to Teachers

Each participant felt that emotional connection to teachers was important to them.

They spoke positively about teachers who made the effort to “be there” and support them and negatively about teachers who did not interact with them on a regular basis. Traci listed several efforts made by teachers as especially supportive of developing a connection and commented on how motivating this was:

Previously Science was OK for me but [my teacher] would use internet memes and put a lot of like jokes in the reading material which I found really amusing because I had very few teachers who had done that before. Old, uh, older people like my parents don't know a lot about memes and stuff like that. I think [my teacher] put an effort into trying to relate more to teenage students by finding stuff like that and integrating it into the lesson. And the effort he put into it was really cool. From that I assumed that he was putting effort into the course or that he put effort into creating the course and I think this was a really big thing for me because, as a student, I felt obliged and motivated to put my best effort into the course since the teacher was putting so much effort into the course. And also in general I wanted to learn but yeah the fact that he put relatable things in the lessons, not everywhere but in some places, that made me more motivated than here this year. [Another teacher] was really interested in hearing our feedback in the way he set up assignments and stuff showed me that he really wanted to know what we thought of the course and how the students were doing. And how he keeps a check on that, like he talks to every once in a while. Like if we don't talk in Skype, he will email us and update us frequently. So that was motivating. So in general I am saying the teachers putting in effort and keeping in contact with us is motivating.

Other participants stressed the importance of frequent and substantial feedback on student work. Jason noted that:

The teacher was always responding to your emails, making sure you knew what you were doing, and if you had any questions. [Getting feedback from my teacher] helps to know what she is like. And just hearing her opinions or other teachers' opinions on certain subjects [builds our relationship].

Still other participants stated that their view of the course and the subject changed due to the emotional connection they shared with the course teacher. In general, participants believed

that a personal connection to the teachers, whether through feedback, communication or the creation of original content, improved the level of emotional connection to them.

(3) Emotional Connection and Culture

Participants felt that a sense of emotional connection was in some ways natural to individual students but that the class structures also encouraged the connection to develop over time through a variety of means. They felt that their shared experiences and stories connected them across the geographical boundaries of their schools and homes. This went beyond participation in online classes and to a feeling of a shared cultural bond based on their international lives.

I think that [community] is all of us comfortable with each other and not withholding any thoughts or opinions because you know we're classmates.. a bunch of us have similar opinions on stuff because we have lived in the same international communities or lived in the same situation. I think that helps build a sense of community. There are these people who are in similar situations, similar places like you are and you are all together online and I think that is really cool (John).

John added that a sense of emotional connection was further developed based on feelings of being “international” and speaking a “common language”. These common experiences, coupled with a supportive online structure, contributed to the ability of emotional connections to deepen. While it is true that some of the participants came from the same or very similar cultural backgrounds, most of the participants in this study could be considered Third Culture Kids (TCK), i.e. children raised outside of the home cultures of their parents for a significant amount of their development. The term Third Culture Kid has been used for more than 50 years to describe children of international mobile parents who travel with them and attend schools in foreign countries. Other terms have been used as well, such as “global nomads” or “internationally mobile” children (Gerner, 1994).

TCK students share many psychosocial characteristics, regardless of the cultural origin of their parents. Schaetti and Ramsey (1999) identified four common themes of TCKs:

1. **Change:** TCK students have a greater ability to adjust to change and may actually thrive off of a constantly dynamic world. This may be true to a lesser extent of all iGeneration students (children born between 1995 and 2015 to a world in which the Internet is already present) but it is a fact of life for students whose parents' jobs may necessitate an international move every 2-6 years.
2. **Relationships:** TCKs are known for their ability to establish new friendships quickly and adjust quickly when losing them.
3. **Worldview:** Because of their international experiences, TCK students have a broader view of the world than friends and relatives in their home country and/or host country.
4. **Cultural identity:** TCK students often have to overtly learn innate cultural patterns that exist in their home countries. This threatens the development of a deeper emotional connection to their home country peers but could also add to a sense of emotional connection within similar groups abroad.

One of the challenges for a TCK is the feeling of homelessness, of not being able to identify and emotionally connect with a greater community (Hoersting, 2010). An interesting side-effect of Big Idea project interactions could be the creation of a virtual space to connect students with similar stories across geographical boundaries and within an academic context, students who share similar worldviews, flexibility to change, a rootlessness in terms of cultural identity and a thirst for stable relationships, particularly at small schools. In a study of foreign born family therapists, Niño, Kissil and Davey (2015, p. 130), found that participants from widely different cultures, "reported looking for common experiences...which facilitated clients being heard and understood." Participants in this

study, felt that the conversations in which they engaged created a portrait of themselves and these portraits allowed the other students to understand who they were and build a connection from there.

E. The Many Impacts of Interaction

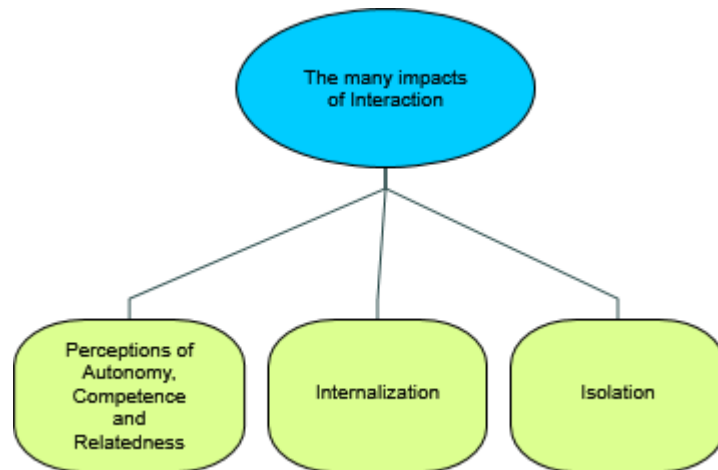


Figure 21: Theme 2 The many impacts of interaction

Social interactions are vitally important for success in supporting student needs in an online context (Rovai, 2000; Rovai, 2007, Xie & Ke, 2011). Participants generally felt that interactions were important to them and an important part of their online and offline experiences. Participants felt that the Big Idea was an excellent opportunity to participate in interactions with their fellow students as well as their online teachers. Jason felt that, “you get the interaction with the students. That's a good thing...I think most of the classmates I have would also say that it's important- the most important.” Participants also seemed to think that these interactions were an appropriate avenue for seeking to meet Relatedness needs in an online context but with a very different feeling than in face-to-face contexts. They further indicated that these interactions could help to compensate for a lack of Relatedness in the face-to-face environment for some of them. For example, John stated that:

Interaction is important to me. I definitely need [the Big Idea] because I don't interact with many people as far as I feel. So, I'd like to participate and interact with teachers and learn more stuff about other courses even though I am not taking them.

Quality interactions in the online environment may increase perceptions of Autonomy, Competence and Relatedness. Given that online interactions, whether in the Big Idea project or in regular online classes are more heavily geared to academics than face-to-face classes, some participants indicated that the opportunities to meet the learning objectives through interactions with students and teachers were greater in an online context as compared with face-to-face courses. Rovai's findings (2000, p. 287) support interactions influencing learning where, "each learner's understandings are influenced by interactions with others." This can further lead to a satisfaction with the learning experience where students are able to feel their academic needs are being addressed and met (Delahunty, Verenikina & Jones, 2014).

1. Interaction and Autonomy

Participants felt that the ability to control the direction of the discussions in forum-based activities and elaborate on personal opinions was a major strength of online interactions. John described the interactive parts of his online classes as having two parts where the, "forum class is fully controlled by us and that's where we discuss our opinions." Jason mentioned the ability to review the course material and forum posts as an additional Autonomy-supportive feature. Finally, Traci felt that the Big Idea project, "helps me have serious discussions with people my age which is quite rare here in real life. It just rarely happens in real life and that is really important for me." These findings were supported by the work of Eneau and Develotte (2012) in their investigation of collaborative online learning to support Autonomy as well as Ismail, et al. (2013) and Lin, Lin & Laffey (2008).

2. Interaction and Competence

Work on the influence of student-student interaction on perceptions of Competence is relatively recent and limited compared to student-teacher interactions (Furrer & Skinner, 2003) but seems to be important in supporting perceptions of Competence around attaining learning successes and developing communities of learners (Sadera, et al., 2009; Xie & Ke, 2011). Participants found that quality interactions in the online environment may increase perceptions of Competence. Nick represents the view of several participants in his perception that online coursework, centered around forum-based activities, was more focused than in face-to-face courses, “*online people, yeah, are **more focused** and in physical life, people would tend to get off-topic.*” Perhaps this is due to the academic nature of the forums, where interactions are more focused on academic dialogue. Xie and Ke (2011, p. 927) stressed the need to encourage social interactions as a way of facilitating “content-related knowledge construction processes.”

Interactions in forums can lead to access to broader knowledge and greater depth of understanding through discussions with peers and teachers. According to Tammy:

[Forums] are quite important because I guess you acquire even more knowledge because for every question they [fellow students] know more things. And each one can add something that they know that I didn't know and it develops me. It like develops my knowledge. If we don't discuss, nothing really changes. You do the activity and do watch the videos and you still understand what's going on. But also if you do stuff like beforehand then that kind of helps you out. Like you understand more things. [In the forums] some people ask more stuff.

In depth discussions are not limited to the online context. However, when coupled with participant perceptions that face-to-face discussions are less centered on academic discourse, participants seem to indicate that they feel online interactions, while different than face-to-face interactions, are more Competence supportive. Swan (2001) found that the greater the

emphasis that the course placed on discussions with teachers and peers, the more they believed they learned from the course, thus supporting participants' feelings that interactions provide a strong Competence support.

John also thought that online interactions were useful in soliciting assistance from peers around difficult learning topics, a view supported by Praechter et al. (2013). Furthermore, Jason felt that student-student interactions had the effect of deepening learning by opening the individual up to new points of view:

I think in so ways it's unusual that you get to learn from the peers and you're learning about who they are what they act like and what they see as good and what they see as bad. I mean sometimes you'll find there'll be a subject, I can't think of one right now again, sorry. But there's that subject where everybody just is crazy about because it's something that everybody has a strong feeling for. And then from that you get to see so many different points of view about that subject and about that problem.

There was some agreement that the inclusion of different types of interactions in the online context (e.g. implementing additional synchronous or verbal activities or by increasing teacher participation within the Big Idea project) would increase perceptions of Competence. John discussed a synchronous activity in one of his courses that was very inconvenient but so Competence-supportive that it overshadowed the negatives associated with the added effort expectancy:

Once I had to stay up at night and it was a cold day and I had to stay up to, what was it, 10'o clock at night and do all my work so I could participate with others and be at the same time chatting with other people. It was worth it. But at the time, it was a difficult thing to manage. Even though I did it once, it was worth it. I guess [if I were the instructional designer] there should be some sort of a day where we all get to log in at the same time and talk, like on a weekend. Or suppose we don't have school and are able to participate and talk and do our work at the same time.

3. Interaction and Relatedness

Quality interactions in the online environment may increase perceptions of Relatedness (Watson, 2005; Barbour & Reeves, 2009; Bachman & Stewart, 2011; Praechter et al., 2013) and it is of little surprise that interactions caused the biggest perceived impact on Relatedness within an online context. Participants felt that a high degree of interactions led to an increase in the ability of the online classes to meet the Relatedness needs which, in turn, led to an increase in positive attitudes toward online learning which could, in turn, lead to an increase in interactions. Tammy expressed positive attitudes toward the inclusion of student-student interactions:

The teachers they initiate like the work and they also like add resources and they add discussions, which make fun and interesting courses. Then the students make it more fun and a little more interesting because it's interesting to find out like what other things and interesting to read what they think.

This circular pattern of connectivity between interaction and Relatedness seemed to be a positive indicator that QVS was working to meet Relatedness needs. However, the opposite situation could also exist, i.e. low levels of interaction could lead to a decrease in perceived Relatedness which could cause a decrease in motivation to interact (Tsai et al., 2008).

Participants seemed to feel that online interactions could, indeed, meet their Relatedness needs, especially when those needs were not met locally. When Relatedness needs were not met in their local communities, participants identified these interactions as having a heavier weight to them personally, i.e. participants from smaller schools felt they needed the online interactions in order to meet Relatedness needs. Traci spoke about the need for online interactions given the small peer group locally:

It's really important that you participate in [the Big Idea project] because of the lack of like social, or a lack of classroom discussions in real life. It kind of makes me want to have like these forum discussions and things with other people and other students. So, yeah, it's really important for me to participate

in the Big Idea. Even though I love my [face-to-face] classmates and all of them are interesting people I do get bored with interacting with the same six people every day of the school year. So, what the online socialization helps me with is that it gives me a variety of people to talk to so I don't have to talk to the same people over and over again and get tired of them and still be able to be good friends with them. So, I think it is quite successful in meeting my social needs.

In situations where strong face-to-face communities existed (e.g. at large schools), the opportunities for creating Relatedness-supportive environments through online interactions still seemed possible but the nature and importance placed upon them by the participants were lower and different. For instance, Tammy did not feel she needed a Relatedness-supportive environment online as her face-to-face connections were strong. Still, she expressed very positive attitudes toward her online interactions:

I like best the fact that you get to talk with many people and it's interesting how everyone is from a different country and how everyone you know how like we're all from like all around the world but we're still able to talk to each other and still able to communicate because of this website, and we manage to share points of views.

Throughout their participation in QVS, a variety of online interactions were available to students. As participants become more acquainted with fellow students in their online interactions, their feelings of Relatedness strengthened. At this point, subgroups, with a strong sense of community, formed within the online activities:

I read most of the material for the other classes just to get to know [the students] and when you read the other people's opinions on that subject, you kind of get to know the students that were in there first. You get to hear their opinion those who have studied the subjects and who knows the subject. Like, "I like the person who is reading now...I guess I choose to reply to the people who I like (Tammy).

Sadera et al. (2009), alongside most technology acceptance models, note the importance of the social norm in impacting motivation within the class which supports the claim of Reed

who felt that once he developed significant relationships with his fellow students, he would be letting them down by not contributing sufficiently in the forum. However, the second part of Reed's statement shows a movement beyond the obligation (a controlled regulation) to a more autonomous state and possibly building inner resources to maintain high levels of autonomous motivation (Ryan & Deci, 2000).

When I'm really working with other people, I believe that's what keeps me motivated...when you get to know people it's kind of like, you don't want to let the people down and just want to work with them again and again. And I believe that's what keeps me going...

Most of the interactions that participants engaged in online were asynchronous and in written form. However, participants expressed a desire for more synchronous interactions and also those incorporating Voice Over Internet Protocols as a way of strengthening the connection to their fellow students. For instance, Jason felt that integrating chats into the classroom could be a way of supporting Relatedness. Reed proposed developing audio-based activities where the participants could hear each other's voices and suggested an, "international Skype conversations with everyone in the class." Ice, et al. (2007) and Delahunty, Verenikina & Jones (2014) also suggested the potential importance of integrating voice-based activities into course design. Furthermore, in an asynchronous course, depending on the delay of the responses, it could be argued that the quality of interactions moves from student-student to student-content, a condition that Rovai (2001) felt was less likely to support Relatedness. However, it should be noted that Jason felt that even asynchronous, pre-recorded interactions could convey a sense of emotional connection and increase perceptions of Relatedness.

[Sal Khan from khanacademy.org] has this voice that's really genuine that I've never heard before. And it's kind of like, when you hear, you know, oh man, [you know it's him]. At home I watched some videos about him. He goes and talks to people on shows. Then you get to know him more. He has that special

way of talking...He has that tone of voice where he's like, oops, and then he'll correct himself when he makes an error. Little things that make it more human

Once again, participants highlighted the interactions in the Big Idea project as exemplary. While teachers may be responsible for creating the conditions for interactions within the Big Idea project, it was student-student interactions that appeared to contribute to a stronger chance of meeting Relatedness needs. For example:

I feel like I interact more in the QVS sites than even my actual school. Without the Big Idea project, in my opinion, I would see less people working on the online classes. It would have a big impact on my wanting to work on the online classes (Nick).

[The Big Idea project] is good because you get to learn something about other people, about people that you're working with in class that you don't really get to find out or see in your classes (Jason).

This importance of student-student interaction over student-teacher contradicts several studies (e.g. Swan, 2001; Hadre et al., 2006; Rice, 2006; Shieh, Gummer & Niess, 2008) that hold that student-teacher interactions more greatly impact feelings of both Relatedness and Competence than do student-student interactions. Perhaps the design of other online learning activities did not stress a collaborative, knowledge-creation approach to achieving academic goals but, in any case, the participants in this study overwhelmingly supported the use of student-student interactions as a way of meeting Relatedness needs as well as academic objectives.

4. Interaction can increase internalization

Many participants felt that the Big Idea was designed primarily to foster student to student interactions. John felt that this interaction was enjoyable and the closest approximations to personal interactions that QVS students experienced in an online context.

Being able to interact with the other students at the same time [as teachers] is also making it fun. I think I liked the first Big Idea best. [It was] the closest thing to interacting with people. [It is fun] because you get to see other peoples comments and interacting with other people.

This was particularly true of Stage One of the Big Idea project where all students participated in a common discussion around the general theme of the Big Idea.

I think I like the first stage best... the most interactions that we--the classmates—have is in the first stage. [The Big Idea is] an important part of my online studies. I would like my online classes without the Big Idea a little less. They would be, be more boring (Jason).

According to Ryan and Deci (2000b, 334), “relational supports do promote internationalization and autonomous regulation.” Participants described their interactions in terms that indicated a high potential for internalization. They used terms such as “fun”, “excitement”, “looking forward to”, “interesting” and “playing a game” to describe activities and classes that had higher levels of interaction. Reed noted that it was the extrinsic reward of a higher grade that initially motivated him to undertake the Big Idea project but that the interaction with classmates became the driving force once the participant began the actual work. In other words, something else initially motivated him to participate in the project but the student-student interactions were what motivated him to persist.

I think that getting an A is the biggest motivation to join in the Big Idea project and as I understand the idea of the Big Idea is to gather people together and let them have fun together and learn new materials, in depth materials. Once you cross the line and you actually start to work [with people] on the Big Idea, you kind of get overall excited for it and it gets interesting and you kind of want to learn it. You don't want to stop. You probably even forget about the actual A.

Ryan and Deci's work (2000b, 334) support this finding where, “proximal feelings of Relatedness are even more important for internationalization and integration because...the

desire to belong and feel connected is an absolute essential contributor to people's willingness to take in and endorse values...that are held by significant others."

Conversely, participants used words such as "dull", "tiring" and "boring" to describe activities and classes that didn't stress interpersonal interactions and indicating a controlled, externally regulated condition. For example, John stated that:

I can tell you that doing things like researching or reading a book all by myself is kind of boring. They [teachers in a different virtual high school] just give you videos and you work on them but the videos weren't really interactive so it will make it boring and dull.

Interaction with teachers was also seen as a force for internalization. Several participants commented on the value of interactions with teachers supporting the development of an autonomously regulated form of motivation. These interactions were seen as different than student-student interactions, probably due to the power roles of the teachers, but as a positive. Hadre et al. (2006) believed that older students had a more goal-oriented need for Relatedness with teachers than younger students. Interestingly, Traci felt that the relative importance of student-teacher interactions and student-student interactions was reversed in online classes compared to face-to-face classes and student-teacher interactions took on a slightly more important role online.

I think that other students are more important for motivating students than teachers but in the online class a little more with the teachers than the students. Maybe 60% with the teachers and 40% with the students. Interaction with teachers is more important for success and interaction with peers is more important for fun. I think it is really important to have the same contact with teachers as other students. Different but equally important.

This further contradicts the findings of Guay, et al. (2008) who did not find any link between the importance of friends and autonomous motivation.

When online interactions are supportive of Relatedness needs they become internalized and lead to a greater degree of autonomously regulated motivation (Niemic &

Ryan 2009). John said that he would choose to participate in the Big Idea, with its emphasis on interaction, even if it meant they had to do extra work and when asked what she would do if she had to choose between the Big Idea project and an alternative assignment to get an A, Traci said, “If they were both offered at the same time? I would stay up overnight and do both of them.” This indicates that the need for quality interactions may be integrated into the core self of the participants to such an extent that it transcends other considerations (Deci, et al., 1994). These participant statements are further supported by Roca and Gagne (2008, p. 1597) who found that when individuals “feel connected and supported. They use the system simply for the enjoyment they obtain from it.”

5. Lack of Interaction can lead to Feelings of Isolation

Some participants, particularly those from small schools, expressed feelings of loneliness and isolation due to lack of peer groups in the home communities and one participant felt she needed to reach out to non-peers in her home community in order to meet Relatedness needs. These participants felt they “needed” the avenues of interaction available online in order to meet their Relatedness needs. However, not all online experiences provided the same level of interactions leading to differences in course satisfaction. Some online programs lacked interactive elements, especially when compared to the Big Idea project. Without interactions, feelings of loneliness, boredom and isolation, consciously identified or not by the participants, were present. Jason’s home community is particularly lacking in face-to-face interactions meaning that his Relatedness needs are really only supported in the online environment:

Yesterday was actually a really good, happy day in a streak of longer days and sadder days. I guess I miss having more people around but I was never the popular kid or anything like that. Now, there is one other student, a grade 9 student. And my brother is in grade 8. And then in grade seven and six, there are like five of them...I presently have no social life outside of school. I have

a house and then there is the compound where I live...and all the kids there are 8 years old or under. So, I am not sure if [my social life] is necessarily very important... I think I work better with isolation. But, no, I don't feel isolated, like, away from everybody. I don't think about it too much.

If interactions are not present in the home community, and are not included in the instructional design of the online courses, Relatedness needs will not be supported, leading to feelings of isolation (Tsai et al., 2008; Kim & Frick, 2011) and “may produce a highly fragmented, reactive, or alienated self (Chen, 2007, p. 6746). This is evident in Jason's words above but can also be seen in some of John's statements:

Today I went to school, there was absolutely no one at school which makes a huge difference since I play with [the younger kids] and without them, it would make school boring. I feel like I interact more in the QVS sites than even my actual school where I go. Since I don't have any students or teachers [in my home school], I don't really interact with people my age. I definitely need it [the Big Idea project] because I don't interact with many people, I feel so alone.

However, it does appear possible to design engaging, collaborative interactions into the online context using available technology tools and that these can support Relatedness needs. (Rovai, 2000; Rovai, 2002; Sadera, et al., 2009). Therefore, “belonging and inclusion in the online context appear promising in improving retention in online learning (Thomas, Herbert & Teras, 2014, p. 70),” and reversing feelings of isolation. Traci is also from a school with limited possibility for peer Relatedness. However, she feels that it is possible to fill this gap with online interactions:

The lack of like social, or a lack of classroom discussions in real life kind of makes me want to have like these forum discussions and things with other people and other students. So, yeah, it's really important for me to participate in the Big Idea.

F. Motivation is a Continuum

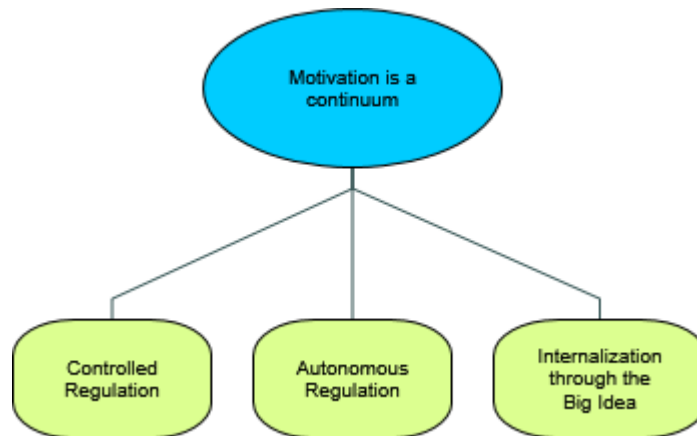


Figure 22: Theme 3 Motivation is a continuum

“Autonomous motivation involves the experience of volition and choice whereas controlled motivation involves the experience of being pressured or coerced (Vansteenkiste, Lens & Deci, 2006, 19).” As students get older, their intrinsic interests become narrower and perhaps contradictory to curricular demands. As this happens, other forms of autonomous regulation (e.g. identified or integrated) become more important in instructional planning. Additionally, participant motivation is dynamic. Levels of regulation shift along the continuum based on a number of things. For example, by Stage Three in the Big Idea project, Jason felt that his fellow students did not interact as much, perhaps because of the energy required in earlier stages. Overall, participants did not feel intrinsically motivated for all of their online activities or for each of their online classes. Still, they often identified and, at times, integrated the importance of specific assignments, grades, programs, classes, etc. to meet future goals.

When I first came to [my school’s town], I didn’t want to get into QSI or any [local] school but I recognized at one point that it would be good for me at some point in the future. I basically feel that I need them [QVS classes] and, for example, any class I am taking right now, I realize I need it to be a successful person in the future..The older people get, the more that goal-orientation becomes more important (John).

1. Controlled Regulation

Examples of controlled regulation, particularly introjected regulation, still existed in how the participants' felt about the instructional design of their online classes. Participants acknowledged being motivated by feelings of guilt over not doing things as required or obligations to a parent, teacher or fellow classmates. John mentioned that he felt guilty when he didn't participate in the Big Idea project because it impacted his GPA and Jason said, "I want to do it because I want to get a good grade, but I also feel like if don't do it, then I'll feel bad about myself because my parents pay a lot to get me into school." Furthermore, many QVS students did not have a choice in taking online classes but were forced into them to fulfill graduation requirements that could not be met locally in their home communities. This speaks to the moderating influence of voluntariness in the Unified Theory of Acceptance and Use of Technology (Vankatesh, 2003) but could also thwart perceptions of Autonomy.

2. Autonomous Regulation

Most participants exhibited autonomously regulated extrinsic motivation in their statements about online education. They identified the value of the courses and activities as valuable for meeting their academic and career goals. Interactions in the Big Idea project seemed to be more autonomously motivated than those in their regular classes demonstrated by an exhibition of enthusiasm for the project and outright shock from Traci who believed that it might be cancelled:

I want to be academically successful no matter what and online or face-to-face it doesn't really matter; I really want to get good grades in all of my classes in general. Getting a grade was, I think, like a good side effect of the project. In general, I enjoyed doing something other than reading and answering questions like we normally do in most like classes. I do expect to participate in the Big Ideas. The whole time I want to in QVS, like the whole time they're on QVS also. We're going to continue the Big Idea Projects, right (nervous tone)?

Reed did not seem to be interested in the concepts of grades (although later statements contradicted this) but felt that the process of learning new knowledge was the biggest energizer of behavior.

I have a different view of life. For me grades are important to build your further life, to build up your momentum to build up where you will go further. But for me, I don't care about the grades as much. If I could get into a good university, I wouldn't care about the grades at all. The thing I care about is the knowledge. Knowledge is the most important. As they say in Russian quite often, "Knowledge is light, ignorance is darkness."

John felt that the *identified* usefulness of the Big Idea was questionable but that participating was very interesting, making the interactions seem more *integrated* into his personal value structure.

Autonomous motivation is more associated with concepts of interest enjoyment (Ryan & Deci, 2000a). The concepts of autonomous motivation are important to educators because the value of the courses can be internalized through instructional designs that encourage the fulfillment of the three psychological needs (Katz & Assor, 2007), and thus become more congruent with self (Deci & Ryan, 2012). It is very important that we view motivation as a continuum with varying degrees of regulation and not as a dichotomy of intrinsic versus extrinsic motivation. While intrinsic motivation may be important for initial engagement in the learning activity, both extrinsic and intrinsic motivation is important for persistence in the online courses (Harnett, St. George & Dron, 2011), especially the higher forms of autonomous regulation that are more closely identified with student goals and sense of self.

3. The Big Idea and Internalization

The Big Idea project appeared to have helped the internalization process in several ways. Participants indicated that the Big Idea project made them happy and their classes more fun,

interesting and less stressful. One participant also felt that it energized her in her other classes as well. This would seem to indicate that the structure of the Big Idea project has been appropriately designed to support the psychological needs of the participants and energize them for further action (Vrasidas & McIsaac, 2000; Garrison & Cleveland-Innes, 2005).

However, both technical difficulties and the effort expectancy to learn the new online platform seemed to hinder internalization of the need to participate in the Big Idea project. Facilitating conditions such as the creation of the FAQ Forum in the second iteration or availability of teachers via email appeared to be able to overcome the negative perceptions created by the technical difficulties (Vankatesh, 2003). Effort expectancy seemed to decrease after the participants became more familiar with the virtual learning environment and its tools, giving credence to the belief that internalization can occur during the course of the instructional program, leading to a higher degree of autonomous motivation.

An unanticipated result of the Big Idea project was the overwhelming support for it in terms of an innovative novelty. Participants stressed several times and in many ways that things that were different, a novelty, a change from the norm were energizing, helping them to internalize the value of the activity and move toward a more autonomous regulation:

It's something different- it's just really uncommon I doubt other schools would do something as different. It makes it interesting. Change, I guess, is good. New things always interest me. It's a new experience and you develop more knowledge and it's more fun to get. And that makes like studying better (Tammy).

Sometimes I get tired of the normal work and I get kind of, like, "ugh, this again?!" It's nice to get something to change up and to work on something that I've never seen before, like something that you don't see in any other school...that makes it like interesting and more fun to be like online (John)

[The Big Idea is] a really innovative kind of thing that I think everyone should be encouraged to be joining on. Activities besides like normal studying are motivating...I think like a lot of people do find the Big Idea approach really interesting because it's more -- it's not just like doing a unit and doing a standardized test and being done with it. It's like exploring more and beyond.

And it also helps me stay motivated in my other classes. I don't know if it is for everyone but I think that for teenagers or kids in general I really like anything that is out of routine- because you are doing the same thing over and over again [normally]- and yes it's important because it creates discipline- but I think if I knew school would be like that I would probably not go, not be interested. But anything out of routine and anything different from what we keep doing is interesting just because it is different (Traci)

[The Big Idea project makes online learning more interesting because], it's definitely the patterns. You don't just continue learning, learning, learning. There's also these reactions and also learning again but it is a different kind of learning, difference, and that is interesting. That is nice. Consistent patterns are, I think, more boring than if they changed (Nick).

Gonzalez-Cutre et al. (2016, p. 166) felt that “the study of novelty as a potential psychological need and a potential antecedent of motivation in multiple domains has received relatively little attention but is receiving increased attention given its importance for human development and growth.” Whether it is a need of its own, a support for the needs of Autonomy, Relatedness and Competence (Sylvester, et al., 2014) or an aid to the integration process, it is clear from the participants’ unsolicited responses that the concept of variety, change, novelty, etc. had a definite impact on a student’s motivation and could be a part of an instructional design process. It is also possible that this is a recent phenomenon and is an expression of the changing habits of millennials and iGeneration students and their relationship to knowledge access and creation (Donninson, 2004).

Chapter Five: Summary and Conclusion

I. Introduction

As a Design-based study, I sought to not only add to existing theories of technology acceptance and use but to also produce practical artifacts (Barab, 2004; Wang & Hannafin, 2005). The initial theory-based goal was to determine the influence of student-student interaction on behavioral intention to engage and persist in the use of online learning. However, two secondary goals emerged as important as I progressed through the study. The importance of teacher-student interactions on motivation to engage in virtual learning quickly emerged as an important area of research within the study. Finally, to avoid the pitfalls of previous Self-determination theories in only focusing on one of the three needs, I added a third research question concerning the impact of perceptions of Autonomy, Competence and Relatedness on a student's motivation to engage in virtual learning. This dynamic flexibility in research design is a hallmark of Design-based research studies and an important consideration when investigating real-world, dynamic phenomena (O'Donnel, 2004). A secondary but equal goal of the study, in accordance with goals of Design-based research studies, was the creation of a practical artifact, in this case design principles for QSI Virtual School online courses. Finally, by grounding the study in Self-determination theory, it was hoped that I would gain deeper theoretical and practical insights into the motivations behind technology acceptance within social contexts like virtual learning.

The first chapter of this research study identified the challenges facing online learning programs, especially within the K-12 context where feelings of isolation often lead to high dropout rates. The literature review looked at technology acceptance models and contemporary theories of motivation and concluded with potential roles that interaction could play in supporting Relatedness in online classes. Chapter three described the study's research

methodology, the rationale for the research design, a description of data analysis techniques and a summary of the pilot research enquiry. The fourth chapter provided a summary of the results of the pilot research enquiry and the findings from the formative evaluations conducted between iterations of the study. It concluded with a detailed thematic analysis of the broad evaluation phase of the main study. The purpose of chapter five is to present a summary of the research questions and themes, unique contributions, limitations of the study and implications for instructional design of online studies. It is hoped that contextual insights found in this study can inform future practice into acceptance and use of online learning programs.

The study progressed through several iterations. Through it, I identified the themes of Autonomy, Competence and Relatedness in an online context, the many impacts of interaction, and the motivation continuum. These were based on the participants' lived experiences and underscored several areas which could be used to guide instructional design of online classes and encourage engagement within the classes. Again, the following three research questions guided this study:

1. What are the effects of student-student interaction on motivation to engage in virtual learning?
2. What are the effects of teacher-student interaction on motivation to engage in virtual learning?
3. How do perceptions of Autonomy, Relatedness and Competence impact motivation to engage in virtual learning?

A. *Summary of the literature*

Online programs offer the potential to be a major innovation in the field of teaching and learning, disrupting traditional patterns that no longer work for today's youth (Donninson, 2004). However, online programs are also plagued with low levels of retention due to feelings of isolation and a reputation as a cold, unsupportive environment (Bawa, 2016).

The Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology have both been used to study technology acceptance in online learning. To be fair, both TAM and UTAUT were initially designed to describe acceptance of stand-alone technological innovations. They were not designed to study complex, social environments and, therefore, attempts to apply them directly to educational studies, fail to recognize that learning is, by its very nature, a social endeavor and should include a component to study and support this.

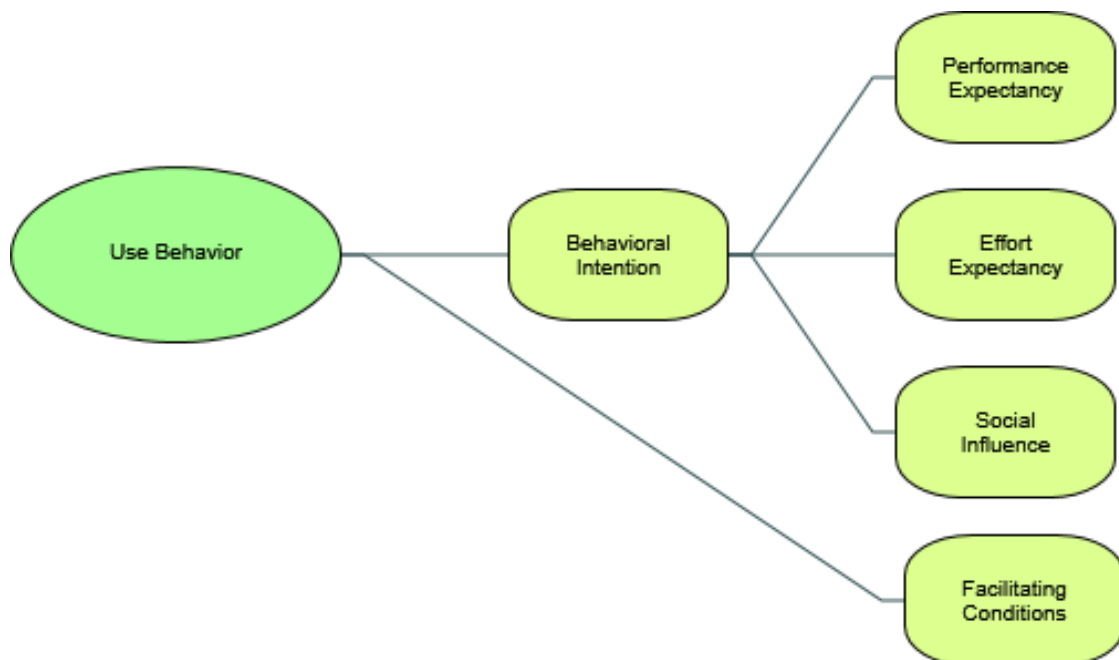


Figure 23: *Unified Theory of Acceptance and Use of Technology*

Furthermore, behavioral intention is, definitionally, a motivational construct but none of the technology acceptance models are grounded in a rich motivational theory. Self-determination theory is a highly respected theory of motivation that has been used in many areas of educational research and so was used to ground technology acceptance within a deeper theory of motivation.

Self-determination theory posits that there are three basic psychological needs that drive human behavior. When an individual's needs for Autonomy, Competence and Relatedness are supported, the individual experiences a healthy state of emotional well-being and is more motivated to accomplish the target behavior. Furthermore, SDT distinguishes between controlled extrinsic motivation and autonomous extrinsic motivation. Controlled motivation is characterized by anxiety, low engagement, feelings of guilt, shame and low sense of self-worth. Autonomous motivation is most closely associated with a greater sense of pleasure, gratification and energy in the target behavior. Therefore, *instructional designers should take care to encourage activities that promote more autonomous forms of motivation.*

All of the technology acceptance constructs can be explained within the context of Self-determination theory and it provides a richer view of the constructs as it delves deeper into the study of human motivation. For example, the constructs of performance expectancy and perceived usefulness are really just indicators of the need for Autonomy, i.e. how closely does the individual performing the task expect the behavior to be aligned with their sense of self. Effort expectancy and perceived effort are closely related to a limited aspect of Competence. When the effort to master the new technology is too great, this is a threat to Competence. While social influence may appear on the surface to be related to concepts of Relatedness, it is more closely related to feelings of guilt for not performing a task or obligation to perform a task, making it an example of controlled motivation. Finally, since

Relatedness has been neglected in technology acceptance literature and in Self-determination theory studies, Relatedness supports have not frequently been included in online instructional designs. This has led to an increase in feelings of isolation and greater dropout rates in online programs. Because there is very little research available directly describing Relatedness and what defines it (Butz & Stupinsky, 2016), this study employs findings from Psychological Sense of Community to gain a fuller picture of this need and its implications in the online, K-12 context.

B. Rationale for and complexities of Design-based research

Design-based research is a flexible lens or methodological strategy balancing the positivist and interpretivist paradigms. It seeks to bridge the gap between theory and practice and has been used in a wide range of designs, especially within the field of education technology. DBR is a challenging but meaningful approach to examining problems within the educational community.

Traditional approaches to educational research have had limited impact on practice. This might be because researchers may be concerned with a particular theory that is of interest to them but that may have limited practical applications. Or perhaps it is because researchers often value statistical significance over the effect that their innovations may have on practice (Berliner, 2002). Practitioners, on the other hand, may show limited interest in theory and instead look for solutions, based on localized evidence, that gives the largest, “bang for the buck.” Too often, innovators become enamored with their innovations and unknowingly develop research designs that yield results proving their innovation was a success. Researchers may seek designs in which the variables lend themselves to easy collection and analysis. This is the case with many technology acceptance models; they strive

for a parsimonious model to explain phenomena that are anything but simple and straightforward.

DBR seeks to be a place where theory and practice can converge based on the belief that research not grounded in practice, “may not account for the emergent and complex nature of outcomes, and the incompleteness of knowledge about which factors are relevant for predication (Design-based research collective, 2003, p. 5).” Therefore, it is significantly different from lab-based research where the researcher seeks to establish a controlled environment and isolate dependent variables. DBR has been described as more closely resembling the methodological strategy of Pasteur, “in which investigation of difficult, applied practice-driven questions demands and fosters studies of fundamental theoretical issues (Dede, 2005, p. 5).” DBR studies are set in the real world amongst the complexities of the real world. DBR researchers recognize that they cannot control all of variables and must become comfortable with large quantities of data that they collect during the study and of the uncertainty that accompanies the study of people. DBR researchers recognize that the world is messy and so look at the desired phenomenon in a naturalistic setting. They approach problems pragmatically, with a range of methodologies and theoretical perspectives and paradigms. They do not seek to replace existing approaches but to incorporate them within the DBR study in order to answer the research questions.

C. Design of the study

A Design-based research approach was chosen for this study as it allowed for the development and refinement of a range of existing theories of technology acceptance and use, grounded in theories of motivation [Bell, 2004]. This recognizes the messiness of real-world settings and was thought to be of particular value in explaining the complexities of human motivations in an online environment. It is also valuable due to its creation of practical

artifacts (Mantai, 2008) used to solve practical problems within QSI Virtual School. These dual goals of adding to theory and addressing practical problems align well with the Doctor of Education program at the University of Bath and its focus on both professional practice and scholarship.

Furthermore, the vast majority of technology acceptance research employs a quantitative approach and I believe this illustrates a deficit in the literature. By adapting a qualitative element to my study and keeping an open mind to the prospect of developing new constructs, I hoped to add a richer description of the phenomena of technology acceptance and use through the lives of those living the experience.

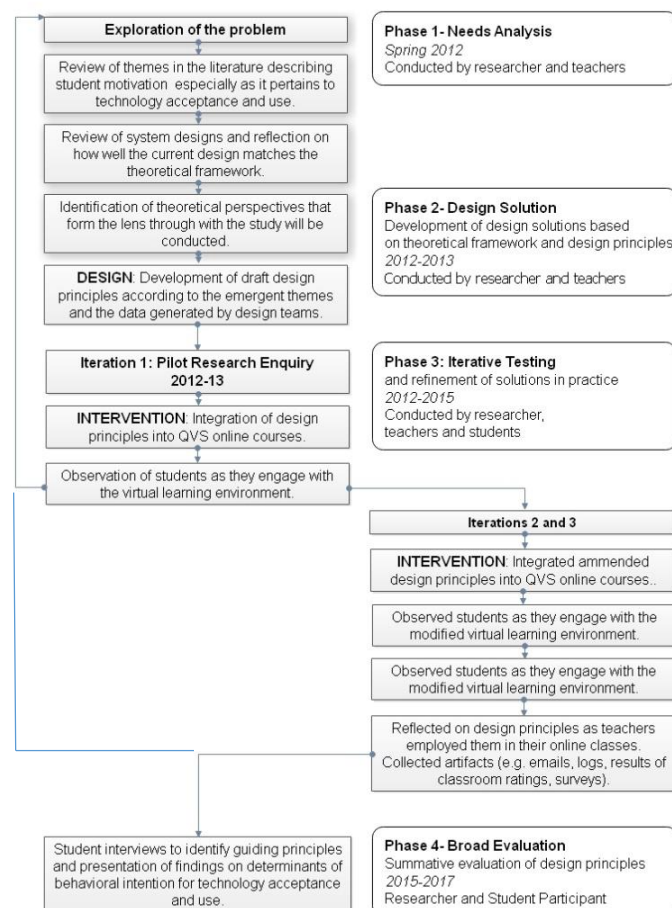


Figure 24: Design of the study

This DBR process progressed through four phases in an iterative process aimed at investigating different aspects of the research questions in order to improve the draft design and refine theories of technology acceptance. Phase one, the needs analysis, took place during the spring of 2012 with an exploration of the literature on best practices in online learning and an overview of theories of motivation as well as technology acceptance and use. The study returned to the needs analysis phase after iterative testing in order to investigate responses to the innovations in the draft design. In phase two, the design solution, a series of draft design principles, grounded in the literature, were developed to investigate appropriate responses to the research questions. Innovations designed at improving interaction were implemented in the first iteration and then radically changed in response to feedback from the participants in the second iteration. Iterative testing, phase 3, looked at how the innovations within the draft design impacted the research questions. The first iteration took place in a pilot research enquiry. A modified version of UTAUT was employed, which included two constructs of social interaction. However, the results of the study were inconclusive and therefore interactions became the primary focus of this study and iterations 2-3.

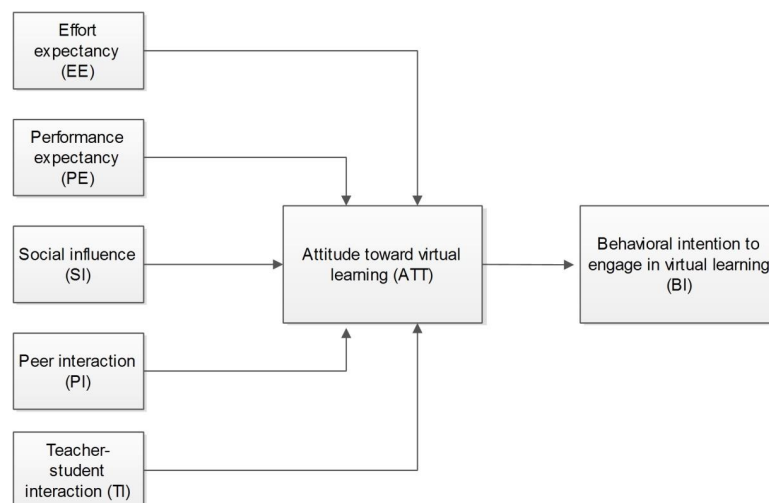


Figure 25: UTAUT with the inclusion of ATT, PI and TI as constructs (Snyder, 2014)

In the final phase, broad evaluation, seven students were interviewed three times each in order to generate rich data on their lived experiences within their online *and* face-to-face classes, particularly centering around their interactions and how it impacted their motivations to accept online learning (Galletta & Cross, 2013). A semi-structured approach was employed, using questions derived from the Sense of Community Index (McMillan & Chavis, 1986) as well as tangential explorations of meaning by actively listening to the participants and the implicit meanings behind their statements (Seidman, 2013). The first interview investigated motivating influences on perceptions of Relatedness and engagement within both face-to-face and online classes as a way of setting the stage to ground further discussions in the personal narratives of the participants. The second interview built off of the first, looking at the concrete experiences of the participants within the Big Idea project. Finally, the third interview explored theoretical constructs with the participants in an effort of guiding them to make meaning of the experiences they detailed in the first two interviews.

As is typical of DBR studies, data analysis also took place in an iterative cycle. Draft design principles were tested in the first iteration in a pilot research enquiry (Snyder, 2014) but yielded conflicting results concerning the importance of interactions in impacting behavioral intention to use and persist in virtual learning classes. Consequently, a more radical innovation was developed by teacher practitioners in Summer, 2013 (<https://www.youtube.com/watch?v=NkqUsDvezVI>) and tested in SY 2013-14 and SY 2014-15. Analysis and refinement of the draft design were undertaken in Summer 2014 in a professional development institute for QVS teachers.

Finally, following the participant interviews, I undertook a thematic analysis of the participant statements using tools from transcendental phenomenology suggested by Moustakas (1994) to draw out meaning from the shared, lived experiences. I then developed a

composite structural description of the shared experience in order to identify motivating influences of technology acceptance and use. I began with a process called horizontalization, giving equal weight and importance to each participant statement and coding them within NVivo11. I then reduced, combined and eliminated overlapping codes or codes that failed to reach the level of horizon, i.e. necessary to understand the experience. I clustered these codes into themes that represented the participants' experiences and returned to the literature to gain a deeper understanding of the emergent themes. Thematically sorted participant statements, supported by research, were then used to create a composite textual description that captured the meaning and essence of particular aspects of the experiences of the entire group.

D. Reflections on the process

Design-based research studies embrace the real world in all of its messiness. They provide answers and reach conclusions that aren't always easy or parsimonious. However, when dealing with the complexities associated with social human endeavors, it is a highly appropriate research fit. Humans are complex and new areas of human endeavor like social interactions within technologically enhanced environments are even more complex and difficult to understand. DBR accepts this complexity but still seeks answers that explain it. To ignore aspects that were deemed important by the participants during their interviews in order to streamline the research is perilous as it does not reflect what is really happening in their lives. DBR studies draw upon multiple theoretical perspectives to answer complex questions. This study was no exception. Technology acceptance models, Self-determination theory and psychological sense of community were all investigated to produce a clearer picture of what happens in technology acceptance that involves social interaction. While this provided a fuller picture of the phenomena, it did entail a lengthier engagement with the literature and this was a struggle within the institutional time-frame allotted. An additional time-based

concern was the iterative nature of the DBR study which meant that a great deal of time was needed to engage with the students and teachers- in this case, the process took several years to complete.

Finally, while DBR studies emphasize first adapting an innovation to the local context, it is typically expected that they are then scaled up to other systems to test the design in a different setting. This study concluded with a broad evaluation of the innovation within QVS. It did not seek to apply the design principles to another setting. This is a shortcoming but also a place for further research, i.e. to test the design principles in other online programs. This is a challenge to the ability to generalize findings and is often associated with concerns about DBR studies.

Another typical concern is the credibility of the data. I focused on providing a rich description of the participants' experiences and, therefore, heavily relied upon qualitative interviewing techniques with phenomenological analysis tools in order to address concerns of validity, if not generalizability. As Seidman (2013, p. 27) wrote, "If the interview structure works to allow them to make sense to themselves as well as to the interviewer, then it has gone a long way toward validity (Seidman, 2013, p. 27).

Despite these concerns, a Design-based research approach was deemed appropriate for this study as it sought to address the dual demands of research and practice. It set the research questions within a naturalistic setting and sought out the real input of those living the experiences in an iterative approach to the innovation. It used multiple data collection points, tools and paradigms in answering the question of the impact of interaction on motivation to engage in virtual learning. Diana Joseph (2004) documented the process of using Design-based research in her study of the passion curriculum. This study could also be

used as a model for future studies of socially-interactive, technology-enhanced learning environments.

II. Research Questions and the META Model

The primary research question focused on the impact of student-student interactions on behavioral intention to use and persist in virtual learning. Two secondary research questions emerged as important to the data as the study progressed. The first was how student-teacher interactions impacted behavioral intention and the second was how perceptions of Autonomy, Competence and Relatedness impact motivation to engage in virtual learning. The first phase of the study took place in a pilot research enquiry (Snyder, 2014) followed by two additional iterations. The PRE used a modified version of the Unified Theory of Acceptance and Use of Technology (see above) to investigate correlations between traditional constructs and two additional social constructs (student-student and student-teacher interaction) and included an open-ended section to allow student feedback beyond the model.

Although the PRE failed to find a correlation between social interaction and behavioral intention, participant feedback suggested a need for some form of social relationship between stakeholders in the online classes. The following two iterations investigated the introduction of a supplementary course that was initially developed to increase student-student interaction. Teachers hosted critical incident surveys within their individual classes and kept anecdotal data about student participation. They brought their findings to annual professional development conferences in order to discuss the implications with their fellow practitioners and modify the draft design if necessary. Over the course of data collection and analysis, teachers found that the majority of responses were highly positive regarding the need for student-student and increased student-teacher interactions.

Finally, during the broad evaluation phase, seven students participated in a series of three interviews aimed at making meaning from their statements about participation within online classes and the Big Idea project. Several participants expressed their opinion that interactions within the Big Idea project energized them in their studies and one participant expressed outright concern that the Big Idea project might disappear.

The PRE extended UTAUT into both the K-12 and virtual learning contexts. By extending technology acceptance into a social context, there appeared to be a need to evaluate the importance of social constructs on behavioral intention in order to improve the predictive ability of the models. However, while the quantitative portion of the PRE failed to find a correlation between levels of social interaction and behavioral intention to use and persist in virtual learning, many students listed the lack of social interaction as a major concern about their participation. The pilot research enquiry found that there was a need for further research into the impact of social interaction on behavioral intent, especially as the field of virtual learning continues to increase in importance in K-12 education.

Critical incident survey results focused heavily on technical issues negatively impacting behavioral intention. However, in the data dialogues during the summer professional development institutes, teachers overwhelmingly noticed an improvement in behavioral intention and engagement in the students through the Big Idea project. Still, some teachers during the 2014 Summer Institute in Malta expressed their opinions that student-teacher interaction may be enough to increase behavioral intention and so a modification was made in the third iteration, focused on limiting social interaction to students and teachers.

A. Research Questions

During the broad evaluation phase, participant responses to the impact of student-student interaction through the Big Idea project were extremely positive. Participants also identified student-teacher interaction as a positive influence on behavioral intention as well as perceptions of supports for Autonomy, Competence and Relatedness. The remainder of this section investigates participant responses in relation to the three research questions.

What are the effects of student-student interaction on motivation to engage in virtual learning?

Rice (2006) found very little research investigating the impact of interaction on student performance, retention and motivation within the K-12 online context. When QVS teachers met to discuss draft design principles for online courses, they still felt that that student-student interaction would increase motivation and retention in the online classes, acting as a counter to traditional perceptions of isolation amongst online students. The Big Idea project was developed to increase student-student interaction and support autonomous regulation through increased Relatedness supports. In the broad evaluation phase, student-student interactions positively impacted perceptions of Relatedness and, therefore, a strong distal support for behavioral intention to accept and use virtual learning to meet academic goals and even to satisfy basic psychological needs. This increased emphasis on online interactions also appeared to support perceptions of Autonomy and Competence as well as those of Relatedness.

The presence of high quality interactions in some online classes and in the Big Idea projects also aided in the internalization process. Several participants described their interactions in the Big Idea project in terms reminiscent of intrinsic motivation or, at the very least, a high level of autonomously regulated behavior. It appears that when perceptions of

Relatedness were low, students felt a need for increased interaction, particularly student-student interaction, in order to promote behavioral intention to use and persist in virtual learning, leading to higher course satisfaction (Tsai et al., 2008). It also appears that an increase in interaction could positively impact perceptions of Relatedness and promote psychological well-being in the students whose home communities do not support their Relatedness needs. Therefore, student-student interaction becomes an important design consideration as both a support for behavioral intention through Autonomy, Competence and Relatedness as well as a means of supporting psychological well-being of students.

What are the effects of student-teacher interaction on motivation to engage in virtual learning?

Like student-student interaction, participants felt that student-teacher interactions were supportive of Relatedness needs as well as in promoting psychological well-being. They felt that teachers who made an effort to establish an emotional connection to students through the use of feedback, personalization of course material, and an online personality, supported feelings of Relatedness. Participants felt that student-teacher interactions allowed the student a chance to discover what the teachers were like in real-life, thus humanizing them and aiding in establishing an emotional connection. This then led to an increase in behavioral intention, thus supporting findings of Swan (2001) who found that higher levels of perceived student-teacher interaction led to higher satisfaction as well as higher levels of learning. Conversely, when student-teacher interaction was lacking, perceptions of Relatedness were low and this negatively impacted their desire to engage in their online classes (Tsai, et al., 2008).

Jason brought up an interesting perception that was echoed by several other participants. He felt that both student-student and student-teacher interactions helped internalize course values leading to a higher degree of autonomous regulation but in a

different manner: “Interaction with teachers is more important for success and interaction with peers is more important for fun. I think it is really important to have the same contact with teachers as other students. Different but equally important.” Based on this, it could be argued that student-teacher interactions were more supportive of identified regulation and that student-student interactions could lead to more integrated regulation. This would be an excellent area for future research but, in any case, student-teacher interactions were definitely seen as increasing autonomously regulated extrinsic motivation and through this behavioral intention as shown in the META model below.

How do perceptions of Autonomy, Competence and Relatedness impact motivation to engage in virtual learning?

Autonomy, Competence and Relatedness are innate psychological needs and are interrelated. Ignoring one of the needs in a study will skew the results and lead to imperfect findings. Failing to support all three needs in instructional design can lead to a decrease in behavioral intention, or less autonomous motivation, or even a situation where the psychological well-being of the individual is impacted. Conversely, courses can be designed to support perceptions of Autonomy, Competence and Relatedness and thereby increase levels of engagement and more autonomous motivation. Studies in online research have often portrayed the three psychological needs as antagonistic to one another but Harnett, St. George and Dron (2014, p. 47) found that “learner Autonomy and social Relatedness can not only coexist but combine in ways that promote motivation to learn.” Findings from this study support the combination of all three needs as a support for student motivation.

There are several characteristics of online learning that are Autonomy supportive. Online classes are seen as offering participants more freedom in how to approach their learning goals in terms of time, place and pace and this can lead to increased behavioral

intention to engage in online learning. Students have access to a wider range of courses by moving online and this could potentially allow them to better meet their identified goals or even goals that are integrated with a deeper sense of self. The Big Idea project led to an increase in perceptions of Autonomy as student had expanded opportunity to investigate topics that were intrinsically interesting to them. Their interactions within the Big Idea project led to a decrease in perceptions of personal control and an increased perception of personal power or agency resulting in an increase in opportunities for self-expression and exploration. This in turn led to a rise in behavioral intention to use and persist in online studies.

Features of online coursework can also lead to increased perceptions of Competence. Limited access to high quality courses or teachers in the home community led participants to seek out ways of meeting their Competence needs online and this increased in their behavioral intention toward meeting course goals. Online classes were seen as appropriately challenging and more authentic, i.e. more integrated with sense of self and more autonomously regulated than face-to-face classes. Furthermore, participants felt that online interactions had a greater academic focus and that they had greater access to their teachers online, which led to higher levels of achievement and, though this, an increase in behavioral intention. This was supported by Fischer (2009) and poignantly demonstrated by Nick, “If I compare it to all my other courses, even my actual school I’ve been going on, I feel more like I have learned more in the QVS site.”

On the other side, high effort expectancy to use the tools of the online courses, coupled with technical issues, sometimes led to decreased perceptions of Competence. Examples of this could be difficulties in mastering online tools, scheduling difficulties across multiple school calendars, and possible technical difficulties found at some of the home

communities. When not controlled for in instructional design principles, these overly high levels of effort expectancy and/or technical difficulties could, in turn, lead to a decrease in behavioral intention.

Strong perceptions of Relatedness in the home community might lead to perceptions of a lower importance in the value of Relatedness online. However, when perceptions of Relatedness are low, feelings of isolation and aloneness can occur, leading to lower autonomous motivation and poor psychological well-being. Several participants mentioned that their Relatedness needs were not being met in the local community and interactions in their online classes were the only means of meeting these needs. While there is no guarantee of cognitive engagement through such interactions (Garrison & Cleveland, 2005), online courses appear to be a viable option to meet Relatedness needs, albeit in a different manner than in face-to-face courses. Participants felt that, due to the asynchronous, text-based environment, supporting Relatedness was more challenging in the online context (Ice, et al., 2007). However, the Big Idea project offered a unique venue for online interactions that led to greater perceptions of Relatedness. This appears to have had a positive impact on behavioral intention. Statements of “need”, “fun” and “like a game” were used to describe interactions in the Big Idea project and several participants felt that their online work would be “more boring” without it.

Butz and Stupinsky (2016) noted that the basal components of all three needs in Self-determination were ill-defined. While I would argue that Autonomy and Competence are both well-represented in the literature, it is very difficult to come to an understanding of what Relatedness is, much less how it impacts motivation. I used the four dimensions of psychological sense of community to help define basal components of Relatedness. Participant responses demonstrated positive indicators for the presence of each dimension in

their online classes, particularly in the Big Idea project. Participants felt that they were **members** in a unique community of interest within the Big Idea project. They felt they had **influence** over the content and flow of learning in their classes and especially within the interactions in the Big Idea project. They further defined their influence as a two-way flow, whereby they could influence and be influenced by their peers based on their online interactions. They also felt their relationship with their teachers was strong enough to be able to influence them if the workload got out of hand. **Integration and reinforcement** of needs was seen as more centered on academic needs in the highly focused online context. Finally, participants felt that they could develop an **emotional connection** to their fellow students and teachers in the online context. Posts in forums let them “know” who the others were and led one participant to describe his online relationships as a “family”. Finally, participants felt that it was possible to design units in order to increase opportunities for emotional connection and thereby increase behavioral intention, avoiding an overly academic focus that Thomas, Herbert and Teras (2014, p. 77) believed would lead to, “pushing aside opportunity for networking and friendship.”

E. The META model explained

In answering the research questions and focusing on motivational theories at the forefront of the analysis, I was able to develop the Motivation Enhanced Technology Acceptance Model (META Model) to expand the knowledge base of the “complex nature of online learner motivation and its dynamic relationships among various antecedents and derivatives (Chen & Jang, 2010, p. 751).” Many researchers have commented on the limited number of attempts at applying concepts of motivational theory to technology acceptance of online programs (e.g. Hadre & Reeves, 2003; Chen, 2007; Liou & Kou, 2007; Rovai, et al., 2007; Harnett, St. George & Dron, 2008, 2014; Zepke, Leach & Butler, 2009; Bekele, 2010;

Sanchez, et al., 2010; Hernandez, et al., 2011; Kim & Frick, 2011; Xie & Ke, 2011) and these studies have focused mainly on technology acceptance models and tried to fit theories of motivation within them. Very few studies have attempted to actually ground technology acceptance in a rich, motivational theory. Chen and Jang (2010, p. 750) applied Self-determination theory to online learning but found limited direct correlation between the models tested and need satisfaction, leading them to conclude that:

..haphazard and aimless supports without addressing students' needs are likely to lead to adverse - even worse than "no effects" -outcomes. It is through the enhancement of students' perceptions of Autonomy, Relatedness, and competency that makes contextual support effective and meaningful to online students.

Bachman and Stewart (2011, p. 183) attempted to develop a draft design of an online course in Self-determination theory, leading to the model below:

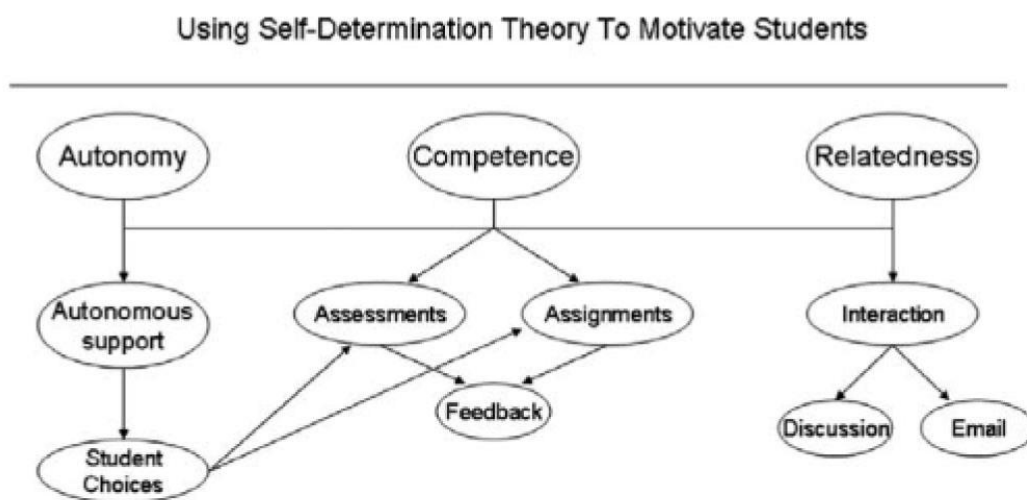


Figure 26: SDT in a web-enhanced course template

The model does an excellent job of showing the equality of the three psychological needs and highlighting interaction as a means of achieving Relatedness. However, as is all too typical of self-determination theories (Lillimyr, Sobstad & Marder, 2008), the study downplays the role

of Relatedness, focusing most heavily on the role of Autonomy. However, in their conclusion, Bachman and Stewart (2011) found a need for grounding online design in instructional theories and strategies in order to best meet the needs of the students.

In investigating the research questions, it became apparent that need satisfaction must be put at the forefront of instructional design. This study is grounded in Self-determination theory while accepting concepts associated with technology acceptance and use. Through this, as demonstrated by the META model below, this study adds directly to the field of technology acceptance and motivational research.

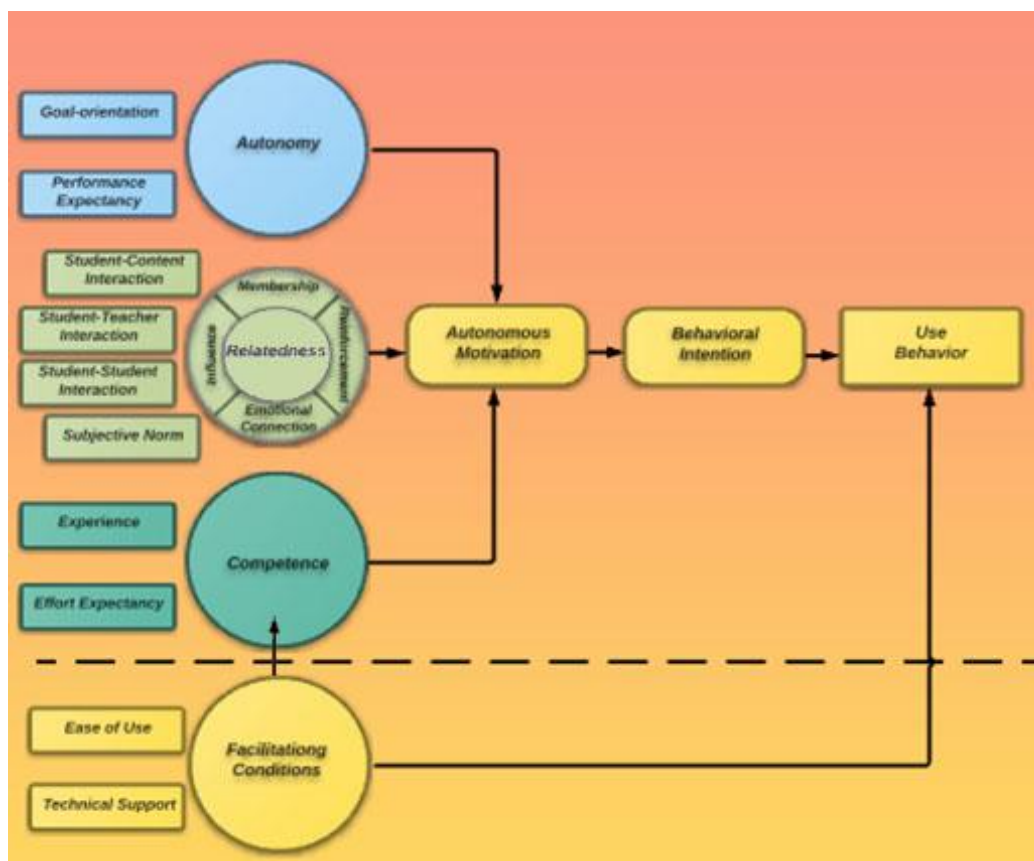


Figure 27: META Model

As can be seen in the three large circles above, this study was grounded in Self-determination theory and accepts Autonomy, Competence and Relatedness as the primary drivers of motivation. The META model also employs constructs of the UTAUT model

(Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions) as antecedents or descriptors of the three needs. By describing technology acceptance as a motivational study, this study adds new knowledge to both of the fields. This model differs from most other models in that it begins with a theory of motivation and learning and applies technology acceptance concepts to it. The three basic needs are characterized as interrelated and equal and lead to higher autonomous motivation when supported, speaking directly to findings related to research question, “How do perceptions of autonomy, relatedness and competence impact motivation to engage in online learning.” I do not claim that all of the needs are equally represented in everyone. Some students may manifest a greater need for autonomy and others for Relatedness. What the META model does is to affirm, in response to the findings from the third research question and the extant literature, that all three needs are important to the psychological and motivational well-being of students. When needs are supported, students become more autonomously motivated and this condition leads to greater behavioral intention to accept and use online coursework. When the needs are thwarted, autonomous motivation will suffer and behavioral intention will decrease.

As in UTAUT, the META model accepts that facilitating conditions may directly impact use behavior without impacting attitudes beforehand. Interestingly enough, participant responses indicated that negative facilitating conditions could directly impact use behavior but could be controlled with proper instructional design. However, positive facilitating conditions seemed to impact perceptions of Competence and were, therefore, only a distal support of behavioral intention and use behavior. It could be that facilitating conditions can be explained as an expression of the need for Competence. Future research should investigate this further.

Possible antecedents to each construct are listed to their left, many of which are used in existing technology acceptance models. While there may be more antecedents, these reflect the main research questions of the study as well as constructs found in TAM and UTAUT. Relatedness, while recognized as a basic psychological need in the literature, is often ignored or given less importance than Autonomy or Competence (Lillimyr, Sobstad & Marder, 2008). This is a true strength of the META model in that it defines the basal components of Relatedness in terms of the four dimensions of psychological sense of community. Given that Relatedness is underrepresented in the Self-determination literature, this study and model could go a long way in filling in gaps in the literature for SDT research, in particular in the area of Relatedness.

Participants felt that their online interactions allowed them to develop perceptions of Relatedness and that these impacted their behavioral intention. Therefore, both student-student and student-teacher interactions were seen as a support for Relatedness and a distal support for autonomous motivation and behavioral intention. According to Reed:

When I'm really working with other people, I believe that's what keeps me motivated...when you get to know people it's kind of like you don't want to let the people down and just want to work with them again and again and I believe that's what keeps me going.

However, while the impact of both forms of interaction on motivation spoke to the first two research questions, results from the composite textual descriptions also indicated that they may additionally impact perceptions of Autonomy and Competence. If this is true, the META model would have to be amended to illustrate interactions as a general antecedent for all three basic psychological needs. As this was beyond the scope of this study, further research would be needed to confirm this condition.

III. Summary of themes

I identified three themes from the interview data of the participants in the broad evaluation phase of this study. Many aspects of the themes, while reaching the level of horizon, were closely related to other themes as well. This finding reflects the commitment of Design-based research to studying learning in a naturalistic setting and “understanding the messiness of real-world practice (Barab & Squire 2004, p. 3).” While this study lists them as separate themes, they are all bound together in the context of the study.

A. *Autonomy, Competence and Relatedness in an Online Context*

Autonomy, Competence and Relatedness are all important and interconnected psychological needs that are responsible for engaging motivation and for overall well-being. Ignoring one need in favor of another in research is problematic as it gives a skewed view of psychological well-being. In practice, this could lead to a decrease in autonomous motivation, a lower energized state, and/or negatively impact the psychological well-being of the students. Conversely, when all three needs are supported, the targeted behavior becomes internalized, leading to more autonomously regulated motivation, which, in turn, can positively impact behavioral intention to accept and persist in online studies. In short, when Autonomy, Competence and Relatedness are all supported, participants should internalize the values of the QVS courses as consistent with their sense of self and become more autonomously motivated to engage in them. This is illustrated in the META model above and in the findings associated with research question #3.

1. Autonomy

Perceived freedom within online courses in terms of time, place and pace of courses was seen as supportive of the participants’ need for Autonomy. This freedom enabled

participants to pursue other things that were more intrinsically interesting to them, whether in school or not. Since smaller QSI schools were not able to offer a rich course selection perceptions of Autonomy in face to face programs were low, i.e. participants were not able to pursue enough courses locally that they believed were valuable to their personal goals. Some participants at larger schools experienced this as well when they had scheduling problems or did not have access to specialized coursework. This meant that they could not pursue areas of academic interest consistent with their identified goals. Access to supplementary QVS courses solved this issue or at least improved upon it and thereby supported students' perceptions of Autonomy. The Big Idea was also seen as Autonomy-supportive by allowing students the freedom to explore aspects of individual projects that had a higher intrinsic value to them. Participation in the Big Idea project might not have come out of an intrinsic interest but was definitely more autonomously regulated than many traditional programs in the ability to extend learning into areas of personal interest.

2. Competence

The same access to courses consistent with identified goals mentioned above as a support for Autonomy could also be applied to Competence. Participants were able to feel more successful in their studies when they had access to a richer course selection. This interrelatedness of Competence and Autonomy is supported by Ryan and Deci (2000a) and Hadre et al. (2006) who found that perceptions of Competence could impact feelings of Autonomy.

Furthermore, many smaller QSI schools in the past were forced to use elementary teachers or teachers from other disciplines to offer courses locally (often independently). Having access to QVS courses also meant that participant could take courses from specialized, highly qualified teachers and this was seen as a Competence support that

environment. Participants felt that having access to appropriate courses and specialized teachers allowed them to have greater levels of achievement in their online classes than in their face to face classes. An additional Competence support in the Big Idea project was the growth of feelings that their work in the projects was appropriately challenging and authentic, i.e. more personal and applicable to real world demands (Deci & Ryan, 2000; Hargreaves, 2007). Finally, it is possible that the mastery of skills necessary for success in online learning could override negative perceptions of effort expectancy as these skills were felt to be valuable in and of themselves. The online context is not the face-to-face context and a different set of skills is necessary to be successful online, both as a teacher and as a learner. When those skills are fostered and the instructional design is Competence-supportive, students are more likely to demonstrate higher levels of autonomous motivation and this will motivate them to continue to engage productively in their online classes.

On the other hand, technical issues and perceptions of high effort expectancy to master the learning platform were seen as threats to Competence. Bachman and Stewart (2011) found that if high effort expectancy limited chances for success, learners would not be motivated to participate at the needed level. However, participants generally felt that the facilitating conditions (e.g. teacher involvement, time for practice, etc.) could mitigate this challenge to a great degree.

3. Relatedness

Participants viewed Relatedness as more than just a support of Autonomy or Competence and more than just a means to encourage internalization but also as an important human need that engaged some learners to a great extent and supported their psychological well-being (Li, et al., 2004). Lack of Relatedness supports in small schools not only impacted motivation to learn but also psychological well-being. For participants with limited peer groups locally,

online interactions became an avenue for meeting these needs. Online courses should be designed to support this. Within this study, the Big Idea project created a special community with supportive Relatedness structures.

Psychological sense of community was a valuable tool for defining basal components of Relatedness. Through its application, it was possible to see that QVS courses and especially the Big Idea project held the potential to support feelings of membership in a community of interest, a unique group that was distinct from others in their home communities, and whose members knew each other from and supported each other in their online interactions. Especially within the heavily student-focused Big Idea project, participants felt that they had influence in the community and that it influenced their actions as well. This was not limited to student-student interactions but also included influence over student-teacher interactions; student voice was seen as especially supported within the Big Idea project. Integration and Reinforcement of Needs could also be supportive of Autonomy in that this aspect of Relatedness is associated with meeting needs integrated into the individual's sense of self, further supporting the finding that the three needs are interrelated. Participants felt that interactions within their online classes and in the Big Idea project helped them to meet academic goals that were identified as important to them. Participants from smaller schools felt that membership in this community of interest was critical in meeting Relatedness needs that was not possible in their home communities due to limited peers. Finally, participants felt that they shared an emotional connection to their fellow online students, particularly those in the Big Idea project. They further felt that this emotional connection could be developed and even expanded in an online context but with some additional challenges over the face-to-face context. As in face-to-face classes, participants also felt a greater emotional connection to some teachers as opposed to others. Generally, participants felt closer to teachers who were more concerned with their lives, those that were more active in the forum classes and those

that were perceived of making a bigger effort in their classes. This increase in emotional connection, influence and reinforcement of needs led to perceptions of increased Relatedness which, in turn, supported a deepening of autonomous motivation and a greater behavioral intention to accept and use virtual learning. As with Autonomy and Competence, when this need is supported in their online programs, students are more likely to be motivated to engage in online learning. Students are then likely to internalize the importance of the program, which should lead to an increase in behavioral intention to persist in their studies (see META model above).

B. The many impacts of Interaction

Participants felt that student-student and student-teacher interactions supported Relatedness and were, therefore, a distal support of behavioral intention, as investigate in the first two research questions and illustrated in the META Model. However, these interactions also demonstrated a support for the needs of Autonomy and Competence, i.e. an increase in quality Interactions supported perceptions of Autonomy, Competence *and* Relatedness. This led to an increase in autonomous regulation and an increase in behavioral intention and further demonstrates that the themes and research connections are interrelated within the real-world context.

Heavy student control of the topics for interactions in the forums led to greater perceptions of Autonomy, which led to greater autonomous motivation and a greater behavioral intention to engage with their online classes. The academic nature of the forum use in online learning interactions was representative of Eneau & Develotte's (2012) "serious conversations" within the classes which created a greater opportunity for meeting the learning objectives collaboratively. This, in turn, led to greater perceptions of Competence as the creation of content-related knowledge increased. This led to a more autonomously regulated

form of motivation and an increase in behavioral intention. Student-student interaction developed as an important aspect of interaction where some participants would seek out their fellow students to meet learning objectives before their teachers. Thus, student-student interactions were seen as highly supportive of the need for Competence.

High quality online interactions were seen as increasing perceptions of Relatedness, especially when Relatedness needs were not met in their home communities. Still, even when participants felt that their Relatedness needs were being met locally, they also felt that quality online interactions could support their Relatedness needs and assist in internalization of the course values. This should then increase autonomous regulation and lead to greater behavioral intention to engage in virtual learning. Where the literature stresses the importance of student-teacher interactions over student-student interactions, both were seen as important to the participants in this study. In comparing participants' experiences in their face-to-face classes with the online experiences and between online classes with varying levels of interactions, it also became apparent that lack of opportunities for interaction could lead to feelings of isolation and a decrease in perceptions of Relatedness (and perhaps Autonomy and Competence as well). This led to a state of more controlled motivation and a decrease in behavioral intention to engage in virtual learning, potentially resulting in an increase in drop-out rates.

C. The Motivation Continuum

Throughout the analysis of participant responses, it became clear that they believed that states of motivation were dynamic and fall at different places along a continuum at different times. This is supported by Ryan and Deci (2000a, p. 69), "a major focus of SDT has been to supply a more differentiated approach to motivation, by asking what kind of motivation is being exhibited at any given time." This has great practical value for teaching and learning in

that not all of the programmatic course requirements placed upon participants speak to their intrinsic interests. In this study, participants believed that courses could be designed in a way that increased their perceptions of Autonomy, Competence and Relatedness. When the needs of Autonomy, Relatedness and Competence were supported, participants believed that taking online classes helped them achieve their identified goals and that some of the course values had even been integrated into their sense of self. Thus, participation within online classes, while not necessarily intrinsically interesting, could be autonomously regulated. This is illustrated in the META model where autonomous motivation is an intermediary between the three needs and behavioral intention.

Participants also recognized controlled forms of regulation in play as motivating forces within their online classes. They felt that examples of introjected regulation through feelings of guilt or obligation impacted their behavioral intention to engage within some activities. For example, one participant felt a motivation to perform well due to the amount of money his parents were paying for his schooling. In the end, multiple forms of motivation and levels of regulation were seen as important in encouraging use and persistence in online courses.

Most participant statements demonstrated that more autonomously regulated motivation led to an increase in behavioral intention. Interactions with teachers were seen as especially important in achieving success (i.e. increased Competence), while student-student interactions were more fun or fulfilling. Therefore, while student-student interactions could be seen as more autonomously regulated, both student-student and student-teacher interactions positively impacted motivation to engage in virtual learning. They were supportive of internalization of course/program values and, therefore, more autonomously regulated extrinsic motivation.

The heavy stress on interaction in the Big Idea project seemed to bear this finding out. Positive, high quality interactions had a positive impact on psychological well-being and led to a more energized state. This had consequences beyond participation within the Big Idea project; more autonomously regulated behavior led to an overall increase in behavioral intention to engage and persist in all online classes. One participant noticed a more energized feeling toward online schoolwork after the completion of the Big Idea project. Usage data from the virtual learning environment also indicated spikes during the Big Idea project and higher usage in the weeks following its conclusion. While this faded approximately two weeks after the conclusion of each Big Idea project, it is clear that participation in them led to an increase in use behavior in other classes as well. Interactions, both student-student and student-teacher, appeared to help increase internalization of course goals, leading to a more autonomously regulated form of extrinsic motivation within the participants. This in turn led to a higher behavioral intent to engage in virtual learning.

IV. Unique contributions of the study and areas for further research

A. *Relatedness and behavioral intention*

One of the most important contributions of this study is the identification of Relatedness as a major motivating force in online learning. This study found that Relatedness plays an important role in technology acceptance and that the use of highly interactive activities and tools could support its development. While Competence and Autonomy have been applied in many self-determination studies within the online context, little work has been done into the influence of Relatedness on behavioral intention and/or motivation (Lillimyr, Sobstad & Marder, 2008). This is especially surprising given the fact that peers play such an important motivation role in the lives of adolescents (Wigfield, Cambria, & Eccles, 2012). This may be because the field of technology acceptance of online learning in

the K-12 context itself is underrepresented in the literature or may indicate a researchers' bias amongst self-determination theorists. In any case, as Relatedness is an organismic need, innate in all human beings (Deci & Ryan, 2000), it is imperative that Relatedness supports are built into design principles. This proved even more important in supporting the needs of participants from very small schools where their Relatedness needs could not be met locally and their psychological well-being was at risk. In other students, with rich social lives in their home communities, Relatedness supports were not seen as a need for psychological well-being but were still recognized as important as a means of promoting autonomous motivation and improving behavioral intention, i.e. they still had the potential to motivate the student to persist in their online classes. Finally, as Relatedness literature is limited, psychological sense of community research was used to elaborate on concepts of Relatedness, thereby enriching the study and providing another avenue to explore this need as it is applied in Self-determination theory and technology acceptance models.

B. The Motivation Enhanced Technology Acceptance (META) Model

The META model of technology acceptance is grounded in Self-determination theory. By placing need support at the front of the model's design, it is possible to develop a deeper understanding of the constructs of technology acceptance. Most current technology acceptance models approach behavioral intention through a technologically deterministic stance with little consideration to the underlying needs of the humans involved. The META model begins with a theory of human motivation and then seeks to explain technology acceptance within it. It lists personal needs as drivers of motivation. This model brings Self-determination theory to the field of technology acceptance, thereby providing a deeper picture of motivating influences in terms of technology acceptance, at least within an online environment. While it was appropriate to approach this research as a primarily qualitative

study in the broad evaluation phase, future research should include the development of a survey instrument to test the META model empirically.

C. The role of novelty

Another very interesting contribution of this study is the identification of novelty as a motivating influence. This may be well-beyond the scope of this study but what makes this so interesting is that this concept came up naturally during the interviews. I did not pose any initial question about novelty or change and yet *each* of the participants indicated that they felt that the Big Idea was different, a change from the normal or something innovative and that this motivated them in and of itself. In general, participants spoke of being motivated by things that broke from the norm, were new, or uncommon. Tammy stated that “Change was good,” but Traci, perhaps described this phenomenon best:

Activities besides like normal studying are motivating...I think a lot of people do find the Big Idea approach really interesting because it's more -- it's not just like doing a unit and doing a standardized test and being done with it. It's like exploring more and beyond. And it also helps me stay motivated in my other classes. I don't know if it is for everyone but I think that for teenagers or kids in general I really like anything that is out of routine- because you are doing the same thing over and over again - and yes it's important because it creates discipline- but I think if I knew school would be like that I would probably not go, not be interested. But anything out of routine and anything different from what we keep doing is interesting- just because it is different.

Gonzalez-Cutre (2016) recently looked at the concept of novelty from a Self-determination theory perspective and proposed it as a need separate from Autonomy, Competence and Relatedness. While I would hesitate to go so far, it does, indeed appear that novelty had a definitive impact on the motivation of participants in this study and is worthy as a topic of future research.

D. Implications for Practice: Design Principles

Too often, online programs are developed as cost-effective solutions without considering research into appropriate pedagogical approaches to the context (Delahunty, Vereniukina & Jones, 2014). However, as a Design-based research study, I have sought to both refine theory and impact local practice. Although teachers and administrators in online schools cannot control all of the phenomena that influence a student, I have recommended to QSI that the following design principles be implemented in all QVS courses based on the results of this study and in order to foster greater perceptions of Autonomy, Competence and Relatedness. Through this, there should be an increase in autonomously regulated forms of motivation and a greater behavioral intention to engage and persistent in online classes (Rice, 2006; Hadre & Reeve, 2003).

QSI Virtual School courses will:

- **Be authentic and student-centered.**

Fischer (2009) found that a major strength of online classes was their ability to be tailored to the student's interests, experience and goals. A learning environment that is authentic to the student will lead to an increase in the amount of meaningful, consequence-laden choices, aligned to the students' interests and goals and integrated with their internal sense of self (Fullan, 1993; Fielding, 2001; Hadre, et al., 2006; Bachman & Stewart, 2011; Guyen, 2013). Learning should also be designed to connect to students' lives outside of school and/or take into account the students' backgrounds (Owen & Moyle, 2008; Fischer, 2009);

- **Be personal.**

Virtual learning environments are unique in that they can be cold and isolating or dynamically adaptive to the students' needs (US Department of Education, 2007). Zucker, et

al. (2003) found that online courses use instructional designs and teaching strategies that focus on the learning styles of students growing up in an era of ubiquitous computing and media exposure. By exploiting this tendency, students' needs can be supported. (Fischer, 2009; Bernard, 2011). The online environment can also be cold and isolating, leaving students feeling alone and out of touch with their online classmates. Teachers should make their classes personal and include social media-type activities to allow students to make meaningful connections with their classmates using activities that mirror communication technologies that are a part of their everyday lives (White, 1997; Barbour & Plough, 2009).

- **Be less controlling.**

While choice is important and controlling environments can damage feelings of Autonomy (Chen, 2007), there is more to the concept of Autonomy than control. Students already feel most learning environments are too controlling and teacher-centered and this has a negative influence on their autonomous motivation over time (White, 1997; Bachman & Stewart, 2011; Boling, et al., 2012). However, online learning, by its very nature, provides us with an environment that allows students to take control of their learning and can promote greater perceptions of Autonomy, Competence and Relatedness (Vrasidas & McIsaac, 2000; Rovai, 2000; Hattie, 2009; U.S. Department of Education, 2010). While technology integration can lead to “a shift in power relations, control of knowledge and traditional school organization (Flanagan & Jacobsen, 2003, p. 128),” the typical teacher response has been to resist the changes and to resist involving students in the dialogue about how they would like to see their education unfold. Therefore, while the potential in the online world exists for frame-breaking change giving greater voice and Autonomy to students, those who traditionally hold the reins of power have been reluctant to share it with them as partners in

the educational experience (Tushman, Newman & Romanelli, 1986; Fielding, 2001; Flanagan & Jacobsen, 2003; Donnison, 2004; Owen & Moyle, 2008; Wicks, 2010).

- **Be transparent.**

Wigfield, Cambria and Eccles (2012) stressed the need for the teachers to support Competence by creating a supportive online class with transparent and appropriately challenging activities. However, in K-12 learning environments, educational goals and sometimes assessments are set externally. Autonomy and Competence can still both be supported as long as teachers attempt to minimize coercion, provide choice when possible and a meaningful *rationale* for limitations when necessary. Furthermore, students must understand how each activity leads to mastery of the desired course outcomes instead of feeling that they are engaged in “busy-work” (Deci & Ryan, 1985; Vansteenkiste, Lens & Deci, 2006; Katz & Assor, 2007; Souto-Otero, 2009; Bachman & Stewart, 2011; Harnett, St. George & Dron, 2011). There is also strong evidence that control and/or structure is necessary in some circumstances. In fact, structure may be even more important in the online class where the nature of the coursework provides students the opportunity to procrastinate and fall behind in their studies (Vrasidas & McIsaac, 2000; Reid, Aqui & Putman, 2009). K-12 students have a lower internal locus of control than students in higher education and may need more structure in order to be successful in the online environment (Cavanaugh, et al., 2004; Huett, Foshay & Coleman, 2008; Fischer, 2009). Additionally, students may actually not even want the ability to make choices. When there are too many choices to be made or the effects of the choices have overly complex or potentially negative consequences, students may prefer to defer the choice to someone with more experience (Huberman & Jiang, 2004; Katz & Assor, 2007). Whatever the level of external control/ structure that is in place, it is

important to be fully transparent with the students about the demands of the activity and/or unit (Garrison & Cleveland-Innes, 2005).

- **Be flexible and receptive to a new understanding of time.**

“The flexibility of online learning may enhance learner’s motivation because it provides Autonomy, thereby aligning learning pace with learning styles (Chen, 2007, p. 6746).” However, in order to achieve this Autonomy-supportive condition, teachers and course designers need to be receptive to an asynchronous, same paced but flexible time frame consistent with virtual learning environments, and to assist students with the time management skills they need to develop (Vrasidas & McIsaac, 2000; Watson, 2005; Fischer, 2009; Bachman & Stewart, 2011; Hernandez, et al., 2011). Flexibility further supports Competence by allowing students to focus their time and energy where and when they need it and Relatedness by allowing students time to think about their forum posts before actually posting them. Finally, on a potentially negative note, the flexible, decentralized nature of online classes offer the ability to disengage as well as to engage and care must be taken to identify those students falling into this category (Delahunty, Verenikina & Jones, 2014).

- **Be Interactive.**

Interacting with others, being connected to them, caring for and being cared for by others is a universal human need called Relatedness in Self-determination theory (Deci and Ryan, 2002). Psychological sense of community researchers define this need as “a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members’ needs will be met through their commitment to be together (McMillan and Chavis, 1986, p. 9).” Students need to feel that they are members of a group and that they have influence in that group. They also want the members of their group to integrate and reinforce their needs within it. Finally, students need to feel that they are

developing an emotional connection to their teachers and their fellow classmates (Vrasida & McIsaac, 2000; Rovai, 2011). Because of the text-based nature of the online classes, the asynchronous nature and the distances involved between course participants, online courses have the potential to be cold and isolating, leading to lower behavioral intention and increased dropout rates (Rovai, Wighting & Lucking, 2004). However, by creating an engaging, interactive classroom, students' Relatedness needs can be supported, increasing their autonomous motivation and behavioral intention to engage in online learning (Rovai, 2001; Rovai, 2002; Delahunty, Verenikina & Jones, 2014).

Design Principle	Sample activities for the online class
Be Authentic <i>Speak to the students internal sense of self</i>	<ul style="list-style-type: none"> • Use surveys to find out student interest and tailor learning to it; • Develop activities that allow the students to explore their home communities and share them with their online classmates; • Make real-world connections to the learning objectives.
Be Personal <i>Overcome the cold, isolating environment of the online classroom</i>	<ul style="list-style-type: none"> • Include jokes, cartoons and videos; • Upload audio files of the teacher's voice; • Create original content. • Get to know the students by using forum-based activities and participate in the forums yourself; • Integrate chat activities; • Integrate group Skype calls.
Be less controlling <i>Release power and watch the learning explode</i>	<ul style="list-style-type: none"> • Use forum-based activities and allow students the opportunity to moderate; • Limit testing and quizzing to formative assessments of understanding; • Give choices in major unit assessments.

<p>Be transparent <i>Assess mastery, not mystery</i></p>	<ul style="list-style-type: none"> • Post learning objectives at the top of each unit; • Post the assessment rubric at the top of each unit; • Adhere to a standardized unit design to minimize effort expectancy of the students in navigating around the QVS site; • Give personal feedback promptly; • Consider using automated feedback when appropriate.
<p>Be flexible <i>Embrace the asynchronous world of online education</i></p>	<ul style="list-style-type: none"> • Ensure that the students understand that QVS courses are asynchronous but same-paced; • Allow a wide window for posting assessments (one week windows work well); • Be present throughout the instructional window to support students as they need assistance; • Track participation in order to ensure that the flexibility is not abused: <ul style="list-style-type: none"> ○ Contact the student as soon as they fall behind; ○ Contact parents and directors immediately if the student does not respond.
<p>Be interactive <i>Partner with the students on their educational journey</i></p>	<ul style="list-style-type: none"> • Include introductory forums at the beginning of every course. • Include “fun” forums for interacting on non-academic topics • Use forum-based assessments and participate in forum discussions with the students; • Use workshop activities;

	<ul style="list-style-type: none"> • Design collaborative activities using Google Suite or other collaborative sites; • Monitor forums to ensure all students work is read; • Read and comment within the forums yourself.
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Figure 28: Design principles and sample class activities

V. Conclusion

This was a Design-based research design aimed at informing both theory and practice in virtual learning acceptance and use. Design-based research studies are situated in real-world environments and, therefore, reflect the messiness of the real-world. This study attempted to provide a rich description of the experiences of a geographically separated group of students in their online program as a way of looking at the factors that motivated them. It also had the goal of building more responsive design principles to guide instruction. While appropriate for the research goals, this study could have been improved by scaling up the research into a different setting. Another possible improvement could have been the development of a survey instrument for the META model. Both of these should be considered for future research into the field.

This study sought to investigate the following research questions:

1. What are the effects of teacher-student interaction on motivation to engage in virtual learning?
2. What are the effects of teacher-student interaction on motivation to engage in virtual learning?
3. How do perceptions of Autonomy, Competence and Relatedness impact motivation to engage in virtual learning?

By investigating theoretical and practical responses to these questions, this study contributed to the fields of technology acceptance and Self-determination theory as well as to the methodological strategies of Design-based research. Technology acceptance models seek to constructs impacting the successful acceptance and continued use of a technological innovation. However, there has been very limited attempts to ground this field in theories of motivation. By looking at acceptance and use first and foremost as an issue of motivation, I was able to ground the concepts in a well-respected theory of human motivation. This enabled a deeper and more theoretically relevant study of technology acceptance. Self-determination theory research is very well-developed in respect to the needs of Autonomy and Competence but much less so for the need of Relatedness. By applying concepts from psychological sense of community as basal components of Relatedness, it is hoped that a more developed understanding of Relatedness will emerge, one that finally recognizes Relatedness for what it is: a psychological need equal to that of Autonomy and Competence. By supporting all three needs, online programs can lead to more autonomous forms of motivation as well as promote healthier student lives. Finally, this study lays out a process for using Design-based research in technology-enhanced learning environments and could very well serve as a model for future studies.

Another important contribution of this study was the development of the Motivation Enhanced Technology (META) model. This model can be used by future researches as a way of investigate technology acceptance grounded in a rich theory of human motivation. It could also be used by practitioners to develop programs and innovations that support the three basic psychological needs, enhancing autonomous motivation, increasing behavioral intention to engage in virtual learning and improve psychological well-being of students. A focus on the constructs listed in the META model puts the needs of people first. The design principles listed in this study were developed from the META model.

There are many challenges for creating an online environment that is supportive of Autonomy, Competence and Relatedness but the challenge lies more in designing online instruction experiences that support all of the online stakeholders' needs, while understanding the tools available to master the learning objectives, than the online environment itself (Rice, 2006; Huett, Foshay & Coleman, 2008). The online context is, indeed, different than the face-to-face context but it is by no means inferior and can provide all the supports necessary to succeed (Barbour & Mulcahy, 2009).

Instructional designs that include active, high quality student-student interactions and student-teacher interactions have the potential for supporting Relatedness needs in an online context. It is true that research abounds detailing conditions of isolation, low satisfaction and engagement, and high dropout rates (e.g. Berge & Clark, 2005; Roblyer, 2006; Lin, Lin & Laffey, 2008; Reid, Aqui & Putney, 2009; Bekele, 2010; Lee, 2010; Thomas, Herbert & Teras, 2014). However, to give in to critics and discard the possibility of achieving a sense of Relatedness in an online context would be a great disservice to our students (Ice, et al., 2007). The Big Idea was developed as a way of meeting student Relatedness needs in an academic context; it is not an end but a means to an end. It created a situation online that provided students with a chance to interact with one another to support not only Relatedness but also Autonomy and Competence- and that should be the goal of all online classes.

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Appendix A: EDC 603: Instructional Design and Technology Units

1. Learning for the 21st Century: this unit included tools available in the QSI virtual learning environment;
2. Assessment for Mastery: this unit focused on a discussion of mastery learning and its implications for assessment as QSI is founded on a mastery learning philosophy;
3. Technology Supported Instruction: this unit included discussions of learning styles, differentiations, social interaction, and critical components in an online context;
4. Learning Theories- this unit included articles from brain-based research as well as a discussion of technology acceptance and use.

Teachers also had to engage in one of the following selective units:

1. Best practices for blended and online learning;
2. The use of reflection in technology-rich environments or;
3. The tools of Moodle, the virtual learning environment in which QVS courses are hosted.

Appendix B: Questions based on a modified Sense of Community Index

I think my online class is a good place for me to be.

The students in the class do not share the same values.

My classmates and I want the same thing from the class.

I know most of the people in the online class.

I feel at home in the online class.

Very few of my classmates know me.

I care about what my classmates think of my actions.

I have no influence over what the online class is like.

If there is a problem in the online class, the people in the class can get it solved.

It is very important to me to take this online class.

The students in the online class generally don't get along with each other.

I would recommend this online class to others.

I expect to take online classes next year.

Appendix C: Sample questions about the participants' personal reflections

Take me through an entire day in which you engaged in the Big Idea project.

Describe what you did in this BI project as closely as you can.

Describe some of your interactions with your fellow students in the BI project.

Have you spoken with anyone about the BI project that wasn't in QVS courses?

What did you tell them?

What do you like best about the BI project. Give specific examples.

If you had to change one thing about the BI project, what would it be.

Do you feel closer to your classmates in the BI project or in your regular classes? Is this important to you.

Do you feel good by participation in the BI project? Why do you think this is?

Are you Facebook friends with anyone in QVS outside of your school? How did this come about?

Appendix D: Clusters of Meaning and Associated Significant Statements

<i>Teacher-student interactions are critical to the success of an online course.</i>	
What did you like best about this online course?	<p>The interaction with the teacher.</p> <p>The teacher was very responsive</p>
What was your least favorite part of this online course?	<p>The dreadful interaction between student and teacher. I was incapable of learning.</p> <p>There was absolutely no instruction online. There were only worksheets for us to complete.</p> <p>The bad contact with my teacher</p> <p>Slow feedback of the teacher</p> <p>I had almost no interaction with my teacher</p> <p>That it took months to get work graded.</p> <p>I can't speak to my teachers till the evenings, or have to wait for a reply for 24hrs</p>
What could we change in the structure of the classes to keep students engaged in the class?	<p>Instruction. It is as simple as that. When students have to struggle to understand and there is no teaching, students will not be engaged.</p> <p>Pursuing teacher-student contact</p>

	<p>There has to be more feedback from the teacher.</p> <p>Make better communication between student and teachers</p> <p>Have more feedback/interaction.</p> <p>More help from teachers</p> <p>Use particularly scheduled Skype-based conversations.</p>
<p><i>Lack of student to student interaction can lead to feelings of isolation</i></p>	
What did you like best about this online course?	No answers
What was your least favorite part of this online course?	<p>Not interacting with each other</p> <p>I had almost no interaction with...other students.</p> <p>Felt like we were left out.</p> <p>No student interaction... having to work largely on my own</p> <p>Working with other students, due to the time differences between the countries and different levels of advancement throughout the course.</p> <p>That you are alone</p>

	There was very little student-to-student discussions and conversations.
What could we change in the structure of the classes to keep students engaged in the class?	Maybe encourage students to use the chat forum. I would make it more interactive

Appendix E: Draft Design Principles following the Pilot Research Enquiry

The following design principles were instituted in QVS courses in order to help teachers design their courses:

Transparency

Tightly aligning instructional activities to instructional goals;

Including automated assignments with instant, formative feedback;

Making directions clear and explicit;

Give quick and meaningful feedback on assignments;

Chunking

Limit the amount of information in each learning module to make it more accessible;

Include external motivators such as reward points for completed assignments;

Interactivity

Make lessons more interactive;

Encourage peer interaction, e.g. by offering student led Skype discussions;

Develop a strong and personal teacher presence with prompt communication;

Develop a relationship with a mentor teacher at the physical school;

Flexibility

Keep flexibility in the work load but provide a broad, time based structure for assignment completion, e.g. give unit deadlines but allow students to turn in work at any point within the unit;

Student Centeredness

Give students options within assignments and/or optional assignments, e.g. students could be given a list of three things that they could do to prove mastery of a given unit outcome and must choose one of them;

Make assignments as fun as possible;

Ease of Use

Choose software and platforms that are stable to limit technical difficulties

Appendix F: Initial Codes

Name	Description	Sources	References
Academic Motivation		2	8
Asynchronous		4	9
Authentic Learning		3	3
Autonomy		12	79
Boring		7	12
Change		1	2
Competence		13	81
Content Mastery		7	19
Competence through Relatedness		6	19
Competence-Autonomy		5	9
Disembodied connection		2	2
Diversity		1	1
Effort Expectancy		5	12
Enjoyment		8	34
F2f	face to face	9	24
Facilitating Conditions		5	22
Focus		1	1
Fun		7	19
Goal Orientation		7	25

Name	Description	Sources	References
Importance of Group Work		2	4
Instructional Design		1	1
Intensity		1	3
Interaction leads to greater Internalization		3	6
Interaction-Autonomy		1	1
Interaction-Emotional Connection		4	18
Interaction-Influence		3	5
Isolation		6	20
Membership-Interaction		5	16
Motivational Continuum		8	8
Amotivation		1	1
External Regulation		2	2
Introjected Regulation		4	7
Identified Regulation		11	41
Integrated Regulation		10	16
Intrinsic		11	30
Motivator		7	10
Novelty and Change		9	34
OL as a Scheduling Alternative		2	2

Name	Description	Sources	References
Online Environment		1	1
Project Based Learning		1	1
Relatedness		12	35
Community		11	53
Emotional Connection		15	126
Influence		11	69
Interaction		9	39
SCi	Student-Content Interaction	6	26
SSi	Student-Student Interaction	13	142
STi	Student-Teacher Interaction	12	89
Membership		10	61
Participation		2	8
Reinforcement of Needs		13	60
Shared Values		7	25
Stage 1		1	1
Stage 2		1	3
Stage 3		3	5
Stress of SDT Constructs		2	2
Structure		1	1
Subjective norm		1	4
Success of BI		11	39
Success of QVS		5	11

Name	Description	Sources	References
Time		1	1
Variety		2	2

Appendix G: Participant statements grouped into themes

G1. Autonomy, Relatedness and Competence Online

Autonomy, Relatedness and Competence are important just by themselves. They might be connected but they are important needs by themselves.

Student interaction means quite a lot to me since I know that I can get some backup support if I don't have a teacher who can explain all the things.

In my experience I always was behind in the FLVS and the main reason for this was because of the interaction between the teacher. For some reason, the teacher was always busy and I had to make an appointment to talk to him and sometime this took a week or so and this made it difficult to finish my work.

John

[Finishing your work on time] works better in the face-to-face than in online courses simply because of that freeness. Although the freeness is good, but it's--at the same time also kind of bad.

Nick

I believe that online classes have reached a point where they are equal to regular classes.

As I said before you get to learn kind of more easy [online] and sometimes that I just think that teacher does not understand your words and that's when your fellow classmates come for help...It's

impossible to learn without friend I think when you have friends in class and you talk to one another, you teach one another, therefore you learn better...Relationships help competency.

One disadvantage that I've experienced is kind of that you don't have a teacher, like a teacher that gives a lesson and at the end of the period and the lesson is over and the students leave the class. Well in online courses students have to finish the work by themselves. Of course the teachers give you the work and support you, assist you but it's not like--it's different because in a class the teachers actually do it at the same time together with the students and they know when they finished something and completed the task. That just leads like online badly to falling behind sometimes or things like that, not finishing all the assignments.

Reed

I think the most important thing to me is having connections with people and being successful with equal importance since they rely on each other... Frankly I think both [Relatedness with teachers and peers] are important for success. I've definitely learned a lot about different topics from not only my perspective but my peers' perspectives too.

Traci

I feel kind of distracted when students are telling jokes or anything. And it makes me feel more like the work is more important, maybe. Because when you're in a classroom, teachers are rushing in and giving you all of this homework, and kids are cracking jokes. I don't

know, I just think it cuts into the seriousness because you're not able to be serious. I mean, you're able to be joking and stuff. But then again, maybe the classes are more boring.

Jason

Sometimes you just want to discuss something with someone, ask for their view point, because it is interesting, fun and it makes you smarter.

Tammy

G2. Autonomy

*I like the [courses] that are online so I can go at my speed...**People can work more freely.** They can work at any time they want to and they can decide if they want to focus on that one subject for a specific time then like intensively do that and then maybe stop working on that subject and focus on something different. And these things are, of course, advantages.*

John

*If something is not working, I just move on to the different activity that I had to do so to me it doesn't even matter...if just like one thing isn't working then I'll just move on to the next...I think that **doing online classes has made me more independent** in terms of like studying on my own and not always having my mom or my dad telling me to like to go do my homework...and I liked independent learning better than having an actual teacher.*

[QVS] gives me more [course] choices.

*All the things that's better, the fact that I don't have to read the book for US History, **I can use the Internet or I can actually use the like library resources or the unit activities to acquire the knowledge** but in my health class I was having to carry this huge book, had to read that, then I would have to find the questions in the book and answer that [her tone was very negative about health].*

Tammy

I mean I don't go on my online classes every single day, like every single, school period that I have. I usually go when I come back home whereas, in school it's obligatory to go to that class.

***You can post as much as you want**, you can discuss anything as much as you want, you can have like 20-page discussion about philosophy. Anything works and that's why I think it's like all about the power, the power of words kind of.*

*And the actual Big Idea is I think that we can choose to do or not to do like **we decide for ourselves**.*

Reed

*I think days when I'm very engaged in my classes, I usually go about my day normally, attending my non-online classes and then when I do get to my online class period I work very intensely and **am focused for the entire period** which allows me to get three or four days' worth of work done.*

*[Online] US history **has helped me focus** on classes that I think are more important, for example I would not have been able to take pre-calculus as a sophomore if I hadn't taken online US history and because I am looking for careers in the science and math range, the class helped me focus my effort in the future I want.*

Ann

*I liked being able to kind of, like, **work when I need to and work at home when I need to**, and being able to email the work and submit it right when I'm done with is very helpful.*

Jason

G3. Competence

*If I compare it to all my other courses even my actual school I've been going on, **I feel more like I have learned more in the QVS site.***

All of the technical issues made it difficult. For example, during the first year, I didn't know anything about how it worked and so it was hard for me to integrate because I didn't know how it worked. That made it hard for to complete things on my own. [structure] is important for me to be successful... it all has learning curves to some extent.

*[In] the 2nd Big idea project, **[I was on] holidays and I could not do anything about it.** If I could do a test before the holidays, I am sure I could have [gotten an A that way instead of doing the Big idea project.*

John

***Online people are more focus** and, yeah, so--and in physical life, people would tend to get off-topic.*

*By doing online courses, you get familiar with a completely different style of learning and **you do acquire some skills** and, yeah, that's probably the reason **I would take online courses** if I hadn't taken them before.*

Nick

*The Big Idea is a good way to earn mastery and it's good because **people can do it. It's not too difficult.***

The teachers here, they don't know, I mean, there's not specialized teacher here in mathematics, which is why I'm taking the online courses.

*In the first year I didn't really like them [online courses]. I was kind of scared of them because you know all these projects and **I had no idea how to work like a scanner or Microsoft Paint or anything.** I get to think about what I'm going to say for a while before I text it.*

Jason.

The design of the unit is important for controlling that possibility of something not working.

*In the beginning I didn't think I would actually like, you know, I will actually acquire like [as much] knowledge as I would in an actual, real, physical class, like but I was wrong and I actually developed a lot of like knowledge about US History. I think that **I actually got more out of the online US History** because like the World history class was just work, work, work, like assignments, assignments, like posters and like I wasn't obligated to read as much as I do on my online courses but I think that reading really developed my knowledge, instead of making posters or something like that.*

Tammy

G4. Relatedness

I am not able to get any interaction with people my age locally in my school. When I go out, it's hard to find people my age. The school (negative tone), you know, it doesn't really provide any help in meeting people of my age. I'm 17 and the closest to me in my school is 15 and the rest are a lot more younger. If I could, I would make this school bigger.

John

*There's just nothing to do [in the country I am living in]. I don't know. **There's really nothing to do here.** And I just can't.. in a way, I'm just in the mode where I just want to be back with friends. I miss the US. I presently have no social life outside of school. I live in a country where most of the people don't know English. I don't really go out too much.. I have a house, but then there's this compound where I live. It's like a military base. And it's quite small, and all the kids there are, like, 8 years old and under. My social life, in terms of what it, what does social life mean to me, I think, I'm not sure that it's necessarily very important, but I do like being able to talk with people every now and then.*

*You know when it comes to learning, I think it's kind of **important to know the other students** who are in your class; even if you don't talk with them very much.*

Jason

*To me, **I don't think [having a sense of community in online classes] is important because I don't take online classes exclusively.***

Ann

*Yes, I think peer relationships are important in and of themselves because I am pretty extroverted and I really like talking with people and getting to know different kinds of people. So, yeah, I don't think [they are important] only for success, of course. **I do like to have relationships with my peers just for the sake of the relationships.** I don't think [having a local community] really effects [my online community] at all for me because I still think of every one of my online course kind of like a real live person. It's kind of weird. I kind think of them like normal people I know. And I don't know many teenagers, so **I think my online community is more important than my real life community here.***

Traci

*I believe we also become friends, really good friends. I must say I never talked like to any of those people. But we still kind of **grew up together** as we know each other now.*

John

G5. Relatedness in the Big Idea Project

*[The Big Idea Project] is a really good opportunity to **get to know** more people and teachers from the online community*

*I notice in class when the people who are in similar courses like when we are all doing the Big Idea, we are discussing like, “Did you see the Big Idea was open” and it’s just like only us who know what’s going on and I think that is kind of cool because we have our own **community**.*

*[In the Big Idea projects] we are all kind of in the same situations so I guess we all **relate** to each other.*

Traci

*It’s really important that you participate in this [Big Idea project], and because of the **lack of like social**, or a lack of classroom discussions in real life it kind of makes me want to have like these forum discussions and things with other people and other students. So, yeah, it’s really important for me to participate in the Big Idea.*

Jason

*It [The Big Idea project] is also **fun** because I see more participation from others and from teachers too.*

*I definitely **need** it [the Big Idea] because I don’t interact with many people.*

John

G6. Membership

I think [our online experiences] kind of gives all of us a thing or something similar to each other, to relate on or something...I feel more at home.

Traci

*I feel we are a **unique group**. I guess we are all talking about the same subject and helping each other to find the answers and agree with each other.*

John

*I definitely [feel at home] in my online classes. It is a very **calm** environment.*

Ann

G7. Membership: Knowing each other, Positive and negative indicators

Positive indicators

*I take the two most popular online classes so **I pretty much know everyone** who is in the Big Idea.*

Reed

*I guess **they know me**, kind of know me, **based on my replies and comments** and because we like when we comment and read each other's replies...I think besides for like one of two people I know everyone on my online classes in QVS.*

*I think Biology- **my classmates knows me as well as I know them.***

Traci

*I think **a lot of people know me from my own like classes**, like half of them, half the people in my online US History.*

Tammy

Negative indicators

I don't know people from advanced mathematics.

Traci

*I don't know everybody. I tried to get to know everybody if I can. But no, I don't know everybody, **I only know a few.***

Jason

*I am somewhat new to this QVS site and I don't really talk to any of them except for when we have, during, the Big Idea...**I do not know them as much as I know other people [face-to-face].***

John

***They probably don't know me at all.** They probably know something about me through- if they've read what I've written and if I had wrote- written a comment on one of their posts.*

Nick

G8. Influence

*The forum [part of the] class is **fully controlled by us** and that's where we discuss our opinions. That's where we have the power.*

*We have quite a lot of influence in the **Big Idea project** because everything pretty much depends on you. You make the post; you do the work. I believe we control about 75% of the work we do.*

Reed

*The other students and myself **have a lot to do with the overall shape of the courses**. Both of my courses encourage people to give feedback reviews.*

Ann

*I guess, **most of the influence I do is in like forums**, so like US History. I can make more own statements and, like, you know, give my own opinions.*

*In the Stage One [of the Big Idea project] **students do have quite a bit of control on their content** because the content is what we are posting. And I think Stage One is actually my favorite part, because you get to express your own opinions.*

Tammy

***I have influence**, especially in Stage One [of the Big Idea]*

Nick

*Sometimes I feel that whenever someone has a problem, **they just** text each other for some answers, if not the teacher.*

John

G9. Influence Continued

*I get to think about what I'm going to say for a while before I text it, **making sure you don't say anything mean.***

*But if it's like somebody has gotten offended or something, I don't think this has happened yet, but **I'm sure we could work it out between us.***

Jason

***I definitely do care** [what my classmates think of me]. I always try to not ah, I always try to not maybe agree with them but ah, even though I've got different perspectives and ideas, I don't try to deny what others think of a specific subject*

John

***I really don't want to offend anyone** or anything like that. I do express myself and I don't mind expressing like any infamous opinions or anything like that but I always do it carefully as to not offend anyone so and yeah.*

*Generally, we get along with each other, **there are some like, disputes about opinions and stuff but generally yes; no one's ever like had a great fat fight or anything.** We just compromise and we understand each other's point of views.*

Traci

Well, when I post something I don't want to offend someone or anything or when I write a comment on their post and again I don't

*want to offend anyone just to be right, something like that. No, **I would care how they would react to my post.***

*I want to fulfill the task. I want to complete it successfully. And at the same time, I think about whether it could offend someone or something like that or yeah. And so, **I consider what my classmates would think about what I write when I write something or making comments.***

Nick

G10. Influence: Reflexivity

*If someone doesn't agree with me, I would like to explain to them my view point so that they can **understand me better**.*

*I would try to make them understand..and maybe **broaden their view** on the subject.*

Tammy

*I think it's just like they're working on different units while the Big Idea's on and they see that nobody has responded yet so maybe it's not like that week or something. That happened to me last year when I wasn't sure which week of the big idea we were. And **then they see somebody respond and it's like oh dang got to get there got to finish the work.***

Jason

*First of all, a lot of people participate [in the Big Idea]. Second you get to share a lot of different opinions which really **can change your opinion** on the topic- often people provide the actual information which helps you to learn more.*

*Pretty much on every single post you get a comment and the comment itself usually **helps you to understand your opinion or change the way you think about the subject** but usually it changes the way you go into the subject like the way you think about the subjects.*

Reed

*I have been influenced by the Big Idea since it shows me new things and more than just facts, **I've learned more opinions than I've ever seen in my life.***

*Sometimes when I read the comments from the classes I read others' opinions about it, even the teachers, and **I get to influence a bit sometimes.***

John

G11. Influence: Technical problems

*I always send [the teachers] a notification. **I just tell him something's messed up here, could you fix it.***

Jason

*As soon as they see a small problem, somebody will notice that and I'm sure if they contact you or something, **the problem will be fixed easily.***

Reed

*We need to email the teacher, and **then she fixes it**, so I guess we do have an influence.*

Tammy

*Like others, the teachers can make mistakes sometimes. However, it is easily solved because **all you have to do is email them** about it and it gets fixed easily.*

Ann

*I think that like if we email (listing names of teachers most engaged in interactions with the students) or someone like that, **the changes would be made very quickly** because I know that you guys respond to feedback really quickly which is really nice.*

Traci

G12. Influence: Teachers

*For unit 6 we had quite a lot of work and Traci, (additional student) and me wrote an e-mail to (the teacher) telling him that we have too much to do for one unit and **he changed the workload**. So I guess we have some kind of influence.*

Nick

*I told [the teacher] that I'm really interested in epidemiology and like working with pathogens and stuff like that. And so, for this Big Idea, **he built the whole stage two of the project around that**.*

Traci

It depends on what kind of problem we're talking about. If it's in an assignment problem I can tell the people in the class can solve it.

*We had a problem in like for example the history class where I picked an assignment and the teacher couldn't open it and then we complained to the teacher and **she changed the assignment and it was all cleared once again**. Yeah I think like pretty much actually any problem which we can have could be solved unless it's something based on [outside of] QVS itself like if the electrical is the school went out.*

Tammy

G13. Integration and fulfillment of needs

*I think in most cases yeah my classmates and I do **want the same thing** as me from the class which is to learn and like explore the topic as deeply as possible or to explore the subject as deeply as possible in our grade level and to kind of go beyond the curriculum. Generally in my class I think most of the people share similar academic values but I don't think all of them do because I feel lot of like I don't know when...A lot of times I feel like I'm giving like really detailed and elaborate answers while there are just people who are just putting in minimal work...and so that's where I kind of feel that people not....**not everyone shares the same academic values as me.***

Traci

***People try hard to accomplish speaking** [target language] fluently in class.*

Ann

***We all want to learn** and we want to develop skills and we want to acquire more knowledge from the subject that we're learning.*

Tammy

*Well I know what I want. I want to learn the subject and get good grades and successfully complete it in a year. **I guess most people would agree with that**, want to learn, get good grades and finish the course probably.*

Nick

*We don't have conversations or something like that. We don't talk about anything else besides for the Big Idea project. **We post our ideas explicitly about things asked** so I guess that's why. It is very focused on academics.*

Jason

G14. Integration and fulfillment of needs: Teachers

I haven't had a teacher in an online course that doesn't share the same academic values as me.

Traci

All the teachers want the same things as me. They like ask me to put my best work into the class and...into the projects and make sure I learn the best way I can.

Reed

*It's motivating to see, to hear, different opinions on topics or what, what's really surprising and motivating is how people find things you didn't find when researching a topic. And this is real speed race how, how when I repost, each of them differs because **they all found from something different. That's the motivating part for me.***

*I would agree that it is very important for me to participate in the Big Idea project because I really enjoy reading what other people find. Usually, **they find something really interesting** I didn't hear about or something I didn't consider, their opinion.*

Nick

*She's [teacher] always like, if like if she feels I need to learn more, then she would give me more resources and she like tell me more about her knowledge and she would **broaden my knowledge** I guess. If I do well she's very nice and she's like she almost feels proud of*

*the stuff. She's like oh great job, I really like this, you've improved
so much you know.*

Tammy

G15. Emotional Connection

I've never seen them [other students] fight.

I see that most of the [opinions] are pretty similar to what I know and feel. They're all interesting to be honest.

John

*The other students don't know me physically because they only have a picture of you to follow. But **spiritually they know me pretty well.***

I thought in some cases they might even know me better than the ones in real class.

*Sometimes we disagree with the opinion of one and another but we're still like one big ball, yeah **I guess a family**, sure why not. It's like you always have the struggle between those two brothers or two sisters because they might pick but they are still family they still like each other it's kind of example.*

***I probably talk to [Jason] for a normal conversation...** we kind of always have different opinions and that's actually pretty fun.*

Reed

***Everybody's cool.** Everybody's really well – everybody acts really well. Nobody's, you know being, mean or anything from what I've noticed.*

***I'm proud of** not only myself but **other people** as well.*

Jason

All of us get along very well and have similar opinions. For example, for one of three prompts I had a very hard time responding because I agreed with everything stated within her post.

Ann

Traci is a very nice girl and she has a lot of incentive to work. She gives nice comments and great responses.

Everyone is nice, everyone. Like whenever someone replies, they say great post, I like what you said, I agree or I disagree.

I tend to gravitate to these five or six people, even though I still try to comment on other people's post.

Tammy

G16. Emotional Connection: Common experiences

*In the online class **we grew up together** because we got to know one another... We got to learn new material together. We got to the same information. You know, when you have twin brothers or sisters, you pretty much grew up together as one because you have the same kind of clothing, the same food, the same parents. Here you pretty much have the same kind of thing because it is a big family. Your teacher is your father, mother, your parents. The other students are your brothers and sisters. You have the same clothing because you learn the same kind of information although you might sometimes have different opinions because, well, you have different identities and cannot think the same. Just like in the real world.*

Reed

***The posts I make build up a discussion and create a conversation..** And these topics are really broad and it's interesting what people think about them.*

Tammy

*I think that most of the people in my online school are international. So, I would say that they're, ah, **very similar in values**... I kind of feel like we all know each other, even when we don't...Most of them know how to speak our languages like I do...I see that most of the knowledge are pretty similar to what I know and my experiences.*

John

*Yeah, I feel more part of it, more, like giving, being a **notable part of the conversation**, and maybe not funny, but expressive. I don't know. I'm not really a social person. I don't talk too much. But when it comes to online classes I think it's easier to talk with people through words and text rather than talking to people.*

Jason

*I think that [community] is all of us comfortable with each other and not withholding any thoughts or opinions because you know your classmates. Well are you aren't too afraid to offend anyone or anything like that...a bunch of us have similar opinions on stuff because **we have lived in the same international communities or lived in the same situation**. I think that helps build a sense of community. There are these people who are in similar situations, similar places like you are and you are all together online and I think that is really cool. That's why I like social networking and stuff.*

Traci

G17. Designing for emotional connection

*[The most important part of the Big Idea project] it's kind of not even the Big Idea itself. It is the introduction because I feel I went to every single person on the forum and I called everyone just to know at least something about the people and that's what means the most for me because **I got to know what the people do, what they think about, what they like**.*

*I also got to see the presentations of other people and some of them even recorded [themselves] that was kind of **interesting to hear their voices** because we never heard each other before yeah that was kind of the highlight of biology that I was most interested about*

*We had a discussion forum there where we posted our favorite author and musician...we had to discuss about like what the musician writes about like what's his meaning of life.. it's really important when you know what kind of music people like. It kind of helps to **shape your opinion** about the person.*

Reed

*The Big Idea allows us to get to know each other more because we get to express our opinions in so many different topics and like um that **helps me know and analyze my classmates better**. So that really helps build a sense of community because you get to know each other better.*

*[I know most of the people in the Big Idea project] because we had those introductory forum posts...I really [like them] because it **kind of let's me know more about who I'm working with**.*

Traci

*I think it's [getting to know them] by seeing **their opinions** and talking with them about their opinions and ideas and you know getting enlightened by their ideas.*

Jason

*Well, when people post things, they're usually expressing their point of views. So by looking at the type of things they post, **you can deduce what type of person they are.** For example, someone may post a rock song; it's pretty obvious then that they most likely like rock. And then when we have discussions, people tell what they think, and by this you can also understand what sort of person he or she is.*

Tammy

G18. Emotional connection: Teachers

*Previously Science was OK for me but [my teacher] would use internet meetings and put a lot of like jokes in the reading material which I found really amusing because I had very few teachers who had done that before. From that I assumed that he was putting effort into the course or that he put effort into creating the course and I think this was a really big thing for me because, as a student, I felt obliged and motivated to put my best effort into the course since the teacher was putting so much effort into the course. **And also in general I wanted to learn but yeah the fact that he put relatable things in the lessons, not everywhere but in some places, that made me more motivated than here this year .. the fact that [a second teacher] was really interested in hearing our feedback in the way he set up assignments and stuff showed me that he really wanted to know what we thought of the course and how the students were doing. And how he keeps a check on that, like he talks to every once in a while. Like if we don't talk in Skype, he will email us and update us frequently. So that was motivating. So in general I am saying the teachers putting in effort and keeping in contact with us is motivating.***

*Old, uh, older people like my parents don't know a lot about memes and stuff like that. I think [my teacher] put an effort into trying to relate more to teenage students by finding stuff like that and integrating it into the lesson. **And the effort he put into it was really***

cool.

*In Math, I sometimes get demotivated because the teacher doesn't really talk to us much and doesn't tell us what our grades are. I haven't talked to my Math teacher the whole year this year actually...[even] the Big Idea Projects are different because I've never actually seen him like reply to one of our posts, and I've never really talked to him on my Skype or email that much, so I don't really know how like what he thinks of our posts, which I actually don't like because it's kind of **like being in the dark** about your grade and how you're doing.*

Traci

***What makes school fun? Well, being able to speak with the teacher is one thing...**To be honest, I never liked literature at all. So [I don't think it's the content that makes it my favorite class], more of being able to do something good because **I get to interact with the teacher.** Actually she can always help me with anything that I ask so I think that's what makes it important for me.*

John

*[My Science teacher] **was always available.** That was very great. He--the course--he kind of read us through it. He wasn't really there since it's an online course but we could see that he wrote compared to giving us information. So, it was somewhat more personal--not more personal but something like that. For example, the joke, you wouldn't see that in just informational text but you saw it in his*

course because he was the person writing the information and the students learned and yeah.

Nick

*It's more the teacher who is playing the most important role in this one [getting people to participate]... **They happen to encourage [students] like not to work but to learn.***

The teachers really motivate you.** They don't only say that part is bad or this part is bad. They also say the parts in which you are good at and you start feeling better about yourself. [My previous school] was **demotivating because the teachers didn't really care about us.

Reed

*I really like my classes. They are a very **friendly and warm environment** and there is **always support from the teachers.***

Ann

*My teacher... she always like, if I participate, **she always says oh great job, and that makes me very like happy you know.***

Tammy

*The teacher was always responding to your emails, making sure you knew what you were doing, and if you had any questions **Everything is done by themselves.** They draw and write on the screen with, like, in their own handwriting, drew little graphs and stuff. It was kind of fun and interesting, and kind of new. I also feel like I learned more [when they created their own content]. **It was more interesting and more captivating.***

*[Getting feedback from my teacher] helps to **know what she is like.***

And just hearing her opinions or other teachers' opinions on certain subjects..[builds our relationship].

Jason

G19. Challenges to emotional Connection

We don't communicate during mathematics at all. We don't post replies. We don't do share questions. So I'm not really sure who takes mathematics.

Nick

I don't know the people from Advanced Mathematics..because I haven't interacted much with my classmates

Traci

*I don't know all the people from my Economics class whatsoever because, well, **I just don't get to know them that much..we don't get to hear each other's opinions.***

Most of the students are considerably younger than me, like thirteen or twelve, and I only take it because I never took it before.

John

*People say that I **sound a lot colder when I type** instead of talk.*

Jason

*I don't really sense they [my classmates] have that much importance. I mean, for me, specifically. They are my classmates and we do the same course together. We get along together but **we're not dependent on each other since we are not next door or something like that** and we do our work independently compared to classes in face-to-face courses where people are literally next to each other and they could really easily talk about something, do things together.*

I don't care in general about what people think about me but I do care about their opinions in terms of..learning material better.

Tammy

*Sometimes [in Economics] I guess we had to do **individual bookwork instead** of like sharing your ideas with other people. **I don't want to consider that as interacting with others.***

Reed

*My classes **do not really encourage students to be social.***

Ann

G20. The many impacts of interaction

Interaction is important to me. I definitely need [the Big Idea]

because I don't interact with many people as far as I feel. So, I'd like to participate and interact with teachers and learn more stuff about other courses even though I am not taking them.

John

*[In the Big Idea] you get the **interaction with the students**. That's a **good thing**...I think most of the classmates I have would also say that it's important- **the most important**.*

*The Big Idea Project is, I think, for [setting up] a community and getting people to work together. I guess that's the point of **The Big Idea**, students together, **creating a sense of community**, get to know each other a bit more.*

Jason

*It's really important to me to participate in the Big Idea Project because, number one, like I think I do the Big Idea Project not only because I want to get an A on my units, but also because **I really like interacting with other students from other courses**. And I'm just really interested in what other people have to say about a lot of things.*

Traci

*[Interaction] is what makes [the Big Idea] different or--not really different but **there's more interactions in the Big Idea than in the rest of the course**.*

Nick

*I think it [interaction] was still very important for me. When you start communicating in the actual [online] classes, it was **so much different than communicating in real life**. It was kind of **like a giant leap from one place to another**.*

Reed

G21. Interaction and Autonomy

*Since I am with the same people every day, we don't get as much discussions as I would want. Not everyone wants to have serious discussions on serious topics. We just kind of goof around a lot. I think **the Big Idea project helps me have serious discussions with people my age** which is quite rare here in real life. It just rarely happens in real life and **that is really important for me.***

Traci

*There are two parts of the online class. There is the forum class and there is the assignment class. I don't have any influence in the assignments class. That's fully provided by the curriculum by the teacher. However, **the forum class is fully controlled by us and that's where we discuss our opinions.***

Reed

*Sometimes, **I wish I could have more online classes in place of others.** I think I learn things better when I'm doing online classes because I can review them more, and when I have a question to ask the teacher, I can just go ask them.*

Jason

G22. Interaction and Competence

[Interaction] is important for me in order to have a good grade.

*Even in, you know, just interaction with people and sharing ideas. **I am able to ask a friend if I have trouble.** I could even ask other people if they know about my mistake or anything...I could ask not just my teacher but people within the community too. That makes it important for me at least.*

*I guess [if I were the instructional designer] there should be some sort of a day where we all get to log in at the same time and talk, like on a weekend suppose we don't have school and be able to participate and talk and **do our work at the same time.***

*Once I had to stay up at night and it was a cold day and I had to stay up to, what was it, 10'o clock at night and do all my work so I could participate with others and be at the same time chatting with other people. It was worth it. But at the time, **it was a difficult thing to manage.** Even though I did it once, **it was worth it.***

John

*If we don't discuss like nothing really changes. You do the activity and do watch the videos and you still understand what's going on. But also if you do stuff like before then also that kind of helps you out. Like **you understand more things** and some people ask more stuff and things.*

*I think they're [forums] quite important because I **guess you acquire even more knowledge** because every question they know,*

they more things and like each one can add something that they know that I didn't know and it develops me, it like develops my knowledge.

Tammy

*I think she's (a fellow student) more kind of a happy person maybe inspirational. She can fire people up. She's probably also really talkative because as I can see on the forum she replies to people, she asks more questions and she kind of, you can say, **she's inspired people to learn.***

*Online people, yeah, are **more focussed** and, yeah, so--and in physical life, people would tend to get off-topic.*

*Well, from what I've experienced, the quality of the courses was pretty much the same of the online courses. In online courses, they are the same for each subject. They present the information and these things and they're the same but face-to-face courses, the teachers are different and yeah. Maybe that's because in face-to-face courses, you interact with your teachers. Yeah, you interact with them. They're there. And **in online courses, they are there too but they're not speaking to you, in person. It's all written or most of that is written.***

Nick

I think in so ways it's usually you get to learn from the peers, because you're learning about who they are what they act like and what they see as good and what they see as bad. I mean sometimes

you'll find there'll be a subject, I can't think of one right now again sorry. But there's that subject where everybody just is crazy about because it's something that everybody has a strong feeling for. And then from that you get to see so many different points of view about that subject and about that problem.

Jason

I would be a bit less focussed than I am right now [in a big school].

Traci

G23. Interaction and Relatedness

*I feel like **I interact more in the QVS sites** than even my actual school.*

*Without the Big Idea project, in my opinion, I would see less people working on the online classes. **It would have a big impact on my wanting to work on the online classes.***

Nick

[The Big Idea project] is good because you get to learn something about other people, about people that you're working with in class that you don't really get to find out or see in your classes.

*I do think **it's a good thing that it's more student than teacher interaction** -- especially, in the Stage 1, it's nice to have students interacting with each other.*

Instead of having the forum, you could have more of a chat.

[Sal Khan] has this voice that's really genuine that I've never heard before. And it's kind of like, when you hear, you know, oh man, [you know it's him]. At home I watched some videos about him. He goes and talks to people on shows. Then you get to know him more. He has that special way of talking...He has that tone of voice where he's like, oops, and then he'll correct himself when he makes an error. Little things that make it more human.

Jason

*I think [student-teacher interactions] are also important in learning how to build relationships with your peers. **It's kind of like a***

stepping stone to building relationships with coworkers in the future. So I think that is why it is important.

*It's really important that you participate in [the Big Idea project] because of the lack of like social, or a lack of classroom discussions in real life. It kind of makes me want to have like these forum discussions and things with other people and other students. So, yeah, **it's really important for me to participate in the Big Idea.***

***In meeting my social needs....um...I mean, hmm...I guess it [my online group] is quite important** because even though I love my classmates and all of them are interesting people I do get bored with interacting with the same six people every day of the school year. So, what the online socialization helps me with is that it gives me a variety of people to talk to so I don't have to talk to the same people over and over again and get tired of them and still be able to be good friends with them. So, I think it is quite successful in meeting my social needs.*

Traci

*I like best the fact that **you get to talk with many people** and it's interesting how everyone is from a different country and how everyone you know how like we're all from like all around the world but we're still able to talk to each other and still able to communicate because of this website, and we manage to share and like points of views.*

*I read most of the material that for the other classes just to get to know and when you leave the other people's opinions on that subject. You kind of get to know the students that were in there first. You get to hear their opinion those who have studied the subjects and who knows the thing subject. Like, "I like the person who is reading now...I guess **I choose to reply to the people who I like.***

*The teachers they initiate like with the work and they also like add resources and they add like discussions, which make it fun and interesting courses. Then **the students make it more fun and a little more interesting because it's interesting to find out like what other things and interesting to read what they think.***

Tammy

***When I'm really working with other people, I believe that's what keeps me motivated**...when you get to know people it's kind of like you don't want to let the people down and just want to work with them again and again and I believe that's what keeps me going...*

*I [feel closer to people in my face-to-face classes] because I talked to those people all the time and we always get to communicate on the same topics like pretty much every single day and well I really felt that's what makes them closer to me then the people who are in Big Idea [because] **even though we work together in the Big Idea we communicate more within our [face-to-face] class and that makes us closer.***

I would say class conversations would be awesome with like international Skype conversations with everyone in the class.

*How can you make someone interact with someone else? You have to **find a way to find out what each one likes so that you can make things so they have something to talk about and then apply that to each of the classes, like Math.** It would make it much easier for people to interact and help them to do assignments together.*

Reed

G24. Interaction can increase internalization

*Being able to **interact with the other students** at the same time [as teachers] is **also making it fun**.*

*I think I liked the first Big Idea best.. [It was] **the closest thing to interact with people**. [It is fun] because you get to see other peoples comments and interacting with other people.*

*I don't know why this happens to me but every time I log into the Big Idea project and I see that there are no comments or no words from anyone, **I don't really want to participate until I see people that are working on it and there are lots of comments**. That is the specific moment, I don't know why I get excited but that is when I start working on it the most.*

*I can tell you that doing things like researching or reading a book all by myself is kind of boring. They [teachers in a different virtual high school] just give you videos and you work on them but the videos **weren't really interactive so it will make it boring and dull**.*

John

I think I like the first stage best... the most interactions that we--the classmates—have is in the first stage.

*[The Big Idea is] an important part of my online studies. I would make sure that for the next time that I always finish my work way before so I can work without it on the Big Idea. And so I can work on the Big Idea without being stressed about my other stuff. **I would***

like my online classes without the Big Idea a little less. They would be, be more boring.

Interaction with teachers is more important for success and interaction with peers is more important for fun. I think it is really important to have the same contact with teachers as other students. Different but equally important.

Jason

*I would recommend participating in the Big Idea Project to everyone. It actually **makes online courses more fun** because, although it does increase work load, **it makes it more fun by like letting you have discussions with other students and other teachers**, and exploring different topics and not only like focusing on your subjects.*

*As I said about the Big Idea, [online classes] wouldn't be as like fun or exciting [without them] ...**I really look forward to my Big Idea classes and I usually can't wait until the next one.***

*I think that **other students are more important for motivating students than teachers** but in the online class a little more with the teachers than the students. Maybe 60% with the teachers and 40% with the teachers.*

Traci

I like Stage one because that's where I like, most of the forums like exist and that's why everyone comments and replies.

*I think both the teachers and the students make it fun and interesting because like **the teachers they initiate like with the work** and they also like add resources and they add like discussions, **which make it fun and interesting**. And **then the students make it more fun and a little more interesting because it's interesting to find out what they think**. I wouldn't stop doing the Big Idea project because I think it's interesting and it's like you meet new people and you talk to them I guess and you interact.*

***Friends do make school more fun**, because if school was simply just studying then it would be tiring. And sometimes you just want to discuss something with someone, ask for their view point, because it is interesting, fun and it makes you smarter.*

Interviewer: If you had a math project that was going to give you an A or the Big Idea Project that was going to give you an A, which would you, choose?

*Participant: If they were both offered at the same time? **I would stay up overnight and do both of them.***

*[It is] quite **fun to participate** in the Big Idea because the topics are usually quite interesting. **When students create an enthusiastic tone, you want to participate more.***

Tammy

*The Big Idea makes them [OL Courses] more interesting. I would agree that it is very important for me to participate in the Big Idea because **I really enjoy reading what other people find**. Usually,*

they find something really interesting I didn't hear about or something I didn't consider, their opinion.

Nick

*I think that getting an A is the biggest motivation to join in the Big Idea project and as I understand the idea of the Big Idea is to gather people together and let them have fun together and learn new materials, in depth materials. **Once you cross the line and you actually start to work [with people] on the Big Idea, you kind of get overall excited for it and it gets interesting and you kind of want to learn it. You don't want to stop. You probably even forget about the actual A.***

*Teacher feedback is where you feel yourself successful but the **student feedback can be that too but is also is fun and being able to work with peers.** Both are motivating and teaching but one is motivating to keep on going and learn new information and the other is more motivational, to the student, to know that you can do it.*

*[The Big Idea project] is a lot of fun because we get to have we have the fun together we got to investigate different materials... **We get to work all together which I consider as playing game.***

Reed

G25. Lack of interaction and lead to feelings of isolation

I feel like I interact more in the QVS sites than even my actual school where I go. Since I don't have any students or teachers [in my home school], I don't really interact with people my age. I definitely need it [the Big Idea project] because I don't interact with many people as far as I, I feel so alone.

Today I went to school, there was absolutely no one at school which makes it a huge difference since I play with [the younger kids] and without them, it would make school boring.

There is very little [interaction] in the FLVS class. The only thing I see is an email once or twice every four months where they ask you to collaborate with someone else. If QVS were more like FLVS, it would be more boring if it were only you working on something.

John

The lack of like social, or a lack of classroom discussions in real life kind of makes me want to have like these forum discussions and things with other people and other students. So, yeah, it's really important for me to participate in the Big Idea.

Yes, [I think peer relationships are important [in and of themselves] because I am pretty extroverted and I really like talking with people and getting to know different kinds of people. So, yeah, I don't think only for success, of course. I do like to have relationships with my peers just for

the sake of the relationships.

Traci

*Yesterday was actually a really good, happy day in a streak of longer days and sadder days. I guess **I miss having more people around** but I was never the popular kid or anything like that. Now, there is one other student, a grade 9 student. And my brother is in grade 8. And then in grade seven and six, there are like five of them...I presently have no social life outside of school. I have a house and then there is the compound where I live...and all the kids there are 8 years old or under. So, I am not sure if [my social life] is necessarily very important... I think I work better with isolation. But, no, I don't feel isolated, like, away from everybody. I don't think about it too much.*

Jason

G26. Motivation is a continuum

*Yeah, I guess **not everyone likes specific subjects.***

Nick

*Like sometimes I'm interested in it and sometimes I'm not depending on the subjects. Most of the things that we studied in the online course were really interesting like, yeah, it's just generally really interesting. **I used to study in Tajikistan and most of the history there wasn't very interesting.***

Tammy

*My view of that **all kinds of motivation exist in a school.***

Reed

*I would rate that all of the extrinsic motivation levels fit for me except for the last one [external] apply to how I view my online classes. For example, when I first came to Brindisi, I didn't want to get into QSI or any Italian school but I recognized at one point that it would be good for me at some point in the future. I basically feel that I need them [QVS classes] and, for example, any class I am taking right now, **I realize I need it to be a successful person in the future.***

The older people get, the more that goal-orientation becomes more important.

John

*The third stage, usually people write their summaries... And they don't comment. **They don't feel like interacting anymore.***

Jason

G27. Controlled regulation

*The QVS site, I [laughter] remember I was going to take Calculus but the only option was going to the FLVS and my Dad disagreed with that. So he would actually rather have a math teacher in the QVS site instead of the FLVS. So I don't know, **I guess it's my Dad** and I actually would rather continue with the QVS site than other sites I don't really know about. Or dislike I guess.*

*On the second Big Idea I didn't do it because I had to much stuff. But in a way I think I should have done it because even though it would have been more work I should have you know gone for that A and gotten the better GPA...**Yeah, I felt kind of guilty.** I felt like everybody else was doing work while I was just you know not really being a part of it.*

John

*I think [getting my work done] lays in myself. I think it might be self-motivation but for my future. **I feel bad if I don't do it** but I also feel like it's important. I think it's for all courses. Mathematics... yeah, I would say it's for all courses. I want to do it because I want to get a good grade, but I also feel like if I don't do it, then I'll feel bad about myself because **my parents pay a lot to get me into school.** I think it's definitely more important what my teacher thinks of me rather than my classmates but it's pretty much equal. It's just that like because **the teacher is in authority figure I think it makes their opinion slightly more important to me than my peers.***

Jason

*My school doesn't have all the subjects that I need. Like I needed
US History to get an academic diploma.*

Tammy

Those are the classes I need to for graduation.

Reed

G28. Autonomous regulation

*I want to be academically successful no matter what and online or face-to-face it doesn't really matter; I really want to get good grades in all of my classes in general. Getting a grade was, I think, like a good side effect of the project. In general, **I enjoyed doing something other than reading and answering questions** like we normally do in most like classes.. I do expect to participate in the Big Ideas. The whole time I want to QVS, like the whole time they're on QVS also. **We're going to continue the Big Idea Projects, right (nervous tone)?***

*I also **have discussions with whatever like the Big Idea topic is with my Dad** because he also finds it really interesting. And we don't get to talk much because he's like working all the time, so this gets up like a really good topic to talk about at home.*

Traci

*Sometimes I don't feel [the Big Idea project] is really useful for my courses but **I always feel like learning new things is important in my life** or interesting or things that I'd like to learn.*

John

My [online] German class opens up more doors for my future than the classes my school provides. Also it is a very supportive environment and my teachers are always there for the students. Both of the classes I take allow me to focus on things I feel are more

important for my future as well as more interesting to me. I love German and I am already semi fluent and the class has helped me a lot. [My online classes] have helped me better my high school experience and have taken a lot of stress off of going to college because they helped me set up a better resume.

Ann

*In the sense of I want to get a grade and finish my courses to get the credits, yeah **I would want to work on my online courses** [they are important to me].*

*I have a different view of life. For me grades are important to build your further life to build up your momentum to build up where you will go further. But for me, I don't care about the grades as much. If I could get into a good university, I wouldn't care about the grades at all. The thing I care about is the knowledge. **Knowledge is the most important. As they say in Russian quite often, "Knowledge is light, ignorance is darkness."***

Reed

G29. The Big Idea and internalization

It actually makes online courses more fun because although it does increase work load, it makes it more fun by like letting you have discussions with other students and other teachers, and exploring different topics and not only like focusing on your subjects.

*[The Big Idea is] **a really innovative kind of thing** that I think everyone should be encouraged to be joining on. Activities besides like normal studying are motivating...I think like a lot of people do find the Big Idea approach really interesting because it's more -- it's not just like doing a unit and doing a standardized test and being done with it. **It's like exploring more and beyond.** And it also helps me stay motivated in my other classes.. I don't know if it is for everyone but I think that for teenagers or kids in general I really like anything that is out of routine- because you are doing the same thing over and over again [normally]- and yes it's important because it creates discipline- but I think if I knew school would be like that I would probably not go, not be interested. But **anything out of routine** and anything different from what we keep **doing is interesting just because it is different.***

Traci

*It's something different and it's not like—it's just really uncommon to and other schools would do something as different. It makes it interesting. **Change, I guess, is good.** New things always interest me. It's a new experience and you develop more knowledge and it's*

more fun to get to get—you get to meet new people. I enjoy doing it...And that makes like studying better.

Tammy

*Sometimes I get tired of the normal work and I get kind of, like, “ugh, this again?!” **It’s nice to get something to change up and to work on something that I’ve never seen before**, like something that you don’t see in any other school...that makes it like interesting and more fun to be like online...[without the Big Idea project] It would be much more boring. It would be more stressful.*

Math I really like by itself. I think it’s just the subject itself. But Science, I never felt I would actually like it but it was the way the teacher made the classes and how they sort of sometimes interact with others instead of just doing assignments.

John

*[The Big Idea project makes online learning more interesting because], it’s definitely the patterns. You don’t just continue learning, learning, learning. There’s also these reactions and also learning again but it is a different kind of learning, difference, and that is interesting. That is nice. **Consistent patterns are, I think, more boring than if they changed.***

Nick

*Well I guess the Big Idea is really an important part of the classes where **people get off topic in terms of their actual class and get to do something fun**. I think it’s important. I think it will be quite boring without the Big Idea. I feel happy [in the Big Idea Project]. I get to*

have lots of interesting stuff- new material. I don't like boring stuff.

It's not good.

Reed
